"A study of progression and retention in Higher Education: The search for an eclectic theoretical framework"

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Abstract

This research is driven from an increase in undergraduate withdrawal and failure rates in certain subject areas, especially the areas of science and technology.

The aim of the study is to explore the various manifestations of 'failure', including: voluntary withdrawal, academic referral and underachievement. A specific scheme run by the School of the Built Environment (now School of Technology - Division of the Built Environment) at the University of Glamorgan is adopted as a case study.

There is increasing concern with regard to the level of student academic ability and the quality and type of tuition received by students prior to their entry into Higher Education. This has become more apparent with increasing numbers of mature and non-traditional students coming into Higher Education without standard school-leaver entry qualifications. With increasing numbers of such candidates participating in Higher Education in the 1990's, it is feared that this will only be accompanied by an equal increase in the numbers of students who withdraw or are referred in their degree programmes.

This study begins with a comprehensive literature review of both past and recent work on student withdrawal and failure in Higher Education both from within the UK and from overseas. A preliminary study has been completed during the first year of the project. This study identified one specific degree course for study - BSc Honours degree in Building Technology and Management as it constitutes a single integrated academic/vocational programme of study. Taking all three year groups, an individual student profile has been constructed of past (pre-university examinations) and present (each semester examination results) academic performance, and information obtained from diagnostic testing and other questionnaires.

In the search for a theoretical framework, existing theories on student motivation and catastrophe theory were adopted in order to explain student academic performance at university.

The thesis aims to identify and pinpoint the crisis points which are reflected throughout the student's academic performance. Examples include personal problems, points where workload stress is at its peak, course structure and teaching methods. Further work closely analyses the individual student approach to studying and intellectual development through in-depth interviews and the use of appropriate tests and inventories. The information obtained from these sources are used to develop, update and redefine existing theories on student withdrawal and failure (Tinto, 1974; 1982), other work by Thomas et al. (1996) and the more recent works published by the University of Wales, Cardiff Institute (1997) and HEFCE (1997). This is further developed by incorporating this work with the existing research on student intellectual development by Perry (1960) and Heath (1964) and the work by Elton (1996) which uses catastrophe theory to explain relationships between commitment, motivation, underachievement and withdrawal.

The main aim of this thesis is to create a new eclectic theoretical framework which will assist in the identification of students 'at risk' before underachievement, withdrawal or failure occurs. This universal model takes the form of a composite set of models which identifies the determinants and associated critical points of withdrawal or failure and processes behind student underachievement, withdrawal and failure.

This work has evolved from a simple project to identify students at risk of not achieving their full academic/intellectual potential to more sophisticated work, which focuses upon the factors which determine the level of academic performance and intellectual development in adults.

The aim of this study is to collect and interpret information on the various academic determinants that may influence success or otherwise in Higher Education, leading to the identification of performance indicators.

The ultimate objective has been to identify 'at risk' and vulnerable students by:

- identifying potentially 'very successful', 'successful' and 'unsuccessful' candidates;
- diagnostic testing - by the collection of all available data on each student and by employing various tests and questionnaires to diagnose an 'at risk' student.
- determining what 'type' of students are at a greater risk of underachievement, of withdrawing or failing their course.

The research followed three main lines or stages of inquiry:

Stage One: the identification and collection of objective and quantifiable data held by the institution. Individual student profiles were constructed from university databases, diagnostic tests and questionnaires. The first part of this data included personal and entry information on all current students which obtained via the university records.

Further to this, all examination and assessment results were logged after each sessional period and from University records. This information was later compiled to create individual student profiles which provided a comprehensive picture of how each student progressed through the course. This data collection includes all students studying on the degree at the time of the survey and three full cohorts of students studying at the University in the years: 1993/94, 1994/95 and 1995/96.

An assessment of the non-completion rate was made for the years 1994-95 and 1995-96, to illustrate the level of non-completion experienced for the degree programme under consideration.

Stage Two: the collection of data on Intellectual Development, the student approach to studying, and a diagnostic test on mathematics. The main objective of the Intellectual Development and Approaches to Studying Questionnaire was to identify intellectual development and to provide a comparative study between the three levels of a degree programme. This follows on from the works of Piaget, Heath (1964; 1978)

and Perry (1970) and the Post-Piaget researcher Sutherland (1980). The mathematics diagnostic test was designed to identify students who could experience difficulties with an essential fundamental component of the course - building mathematics, and its applications through such subjects as structures, materials and building science.

This research proceeds to produce a composite theoretical model of student academic performance in the form of a predictive tool by:

- investigating student intellectual development ;
- investigating the impact of the student approach to studying and learning;
- identifying those students with serious weaknesses in knowledge and skills at entry (eg.. in mathematics and general study skills);
- investigating individual student motivation and the level of commitment to the course possessed by each student.

Stage Three: interviews will obtain qualitative data from the students currently studying on the degree programme, exploring perception and attitudes towards the institution and personal factors that might have an impact on completion. These included:

- financial status
- level of contact and integration with academic staff and students
- career aspirations - commitment to the degree programme and the building industry
- ability and motivation to complete the course (confidence, motivation & background)
- reasons for studying at university
- perceived threats to the completion - possible critical points (critical incidence interviewing)

Stage Four: The research initially sought to identify the real reason(s) for non-completion, but as it progressed a complex picture emerged. It became evident that

there is:

- a positive, but very weak relationship between the standard of entry qualification and exit qualification (the degree classification);
- the degree programme studied received students with very diverse types of entry qualifications (A' Level GCE (from many different subjects), BTEC Construction and Building Studies, Access courses and City and Guilds qualifications).

In conclusion, it was felt that the process of student progression was a particularly complex phenomenon. However, the reason(s) for non-completion and academic success were attributed to the non-measureable qualities of motivation, commitment, choice of degree programme and institution, future career aspiration and the level of student/department/institution interaction. After taking all of this into consideration, the research moved on to develop and suggest ways in which the institution could 'manage' student progression and reduce non-completion. (Note: the Robbins Report of 1963 suggested that non-completion was the responsibility of the institution). The research looked at addresses:

- changes in general teaching and learning strategy
- identifying individual learning problems
- identifying problems associated with admitting students from such a wide range of backgrounds
- dealing with the problem of poor numeracy and mathematical skills
- change in assessment procedures, type and timing - the use of continuous or formative assessment
- greater control over the quality of teaching
- improvement of the structure and organisation of the degree programme
- review of the admissions process - a new criteria for entry
- the induction process - especially at the departmental level

The main aim of this thesis has been to create a new eclectic theoretical framework

which will assist in the identification of students 'at risk' before underachievement, withdrawal or failure occurs. This universal model takes the form of a composite set of models which explains the determinants or the critical points of withdrawal or failure and the processes behind student underachievement, withdrawal and failure.

By constructing a composite set of models within one broad theoretical framework, a clearer description and explanation of the process of student withdrawal can emerge. To achieve this objective, an identification and explanation of the critical or crisis points during a student's academic career is made, where they are more likely to be 'at risk' of withdrawing or failing their course. To achieve this, an individual student profile is constructed from data collected on academic performance, from conducting one-to-one interviews, and compiling an inventory to identify the level of intellectual development. In addition, student academic performance is continually monitored on an individual basis and recorded in the form of an individual performance profile alongside other findings obtained through tests, questionnaires and interviews.

The research provides a 'testing ground' for ideas on how future research could be generated within this field in Higher Education. A main problem with work of this type is the choice of methodology. A main outcome of this research, has identified that a more qualitative approach may be necessary before greater understanding of student learning in Higher Education is fully achieved.

The research work produced two published works: Saunders, D M & Gaston, K L (1996) "An investigation into evaluation issues associated with simulation gaming by way of using a rank ordering exercise" British Journal of Educational Technology, 27,1, pp. 15-22 and Gaston, K L & Graham, M S (1997) "Using research to identify students 'at risk' of experiencing learning difficulties with mathematics", In: "Improving Student Learning through Course Design", (Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University).

The research also utilised various conferences as a means of exploration into the work in progress. In particular, a workshop was offered at the "Student Induction"

conference held at Stoke Rochford Hall on 31st-1st June-July, 1995. This workshop explored what the participants thought about student non-completion and the student experience in general.

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Glossary

ASI	Approaches to Studying Inventory
BTEC	Business and Technician Education Council
BTMD	Building Technology and Management (degree)
CIOB	Chartered Institute of Building
CNAA	Council for National Academic Awards
CVCP	Committee of Vice Chancellors and Principals
GCE	General Certificate in Education
GCSE	General Certificate in Secondary Education
HEQC	Higher Education Quality Council
HND	Higher National Diploma
HNC	Higher National Certificate
IDI	Intellectual Development Inventory
ONC	Ordinary National Certificate
QAA	Quality Assurance Agency
TQA	Teaching Quality Assessment
WD	Withdraw or withdrawal

Chapter 1 Introduction

1.1 The objectives of this research

Although there is anecdotal evidence that non-completion rates are increasing, there is no secure statistical data on non-completion rates, nor are there any grounded explanatory models or theoretical frameworks that identify the causes of non-completion. Concern about non-completion, combined with an evident need for a reliable and informed analysis of contributory factors has led to this study. The aim of the study is to explore the various manifestations of 'failure', including: voluntary withdrawal, academic referral and underachievement. One particular degree programme has been selected because of the multi-disciplinarity of this discipline and the need to study this problem of non-completion on an individual student basis. The BSc (Honours) degree in Building Technology and Management, selected for this research, constitutes an integrated academic/vocational programme of study addressing both technological and managerial topics. Since the late 1980's, much change has occurred in Higher Education and a considerable problem faces the researcher in terms of identifying relevant variables. It is therefore particularly challenging to control in a scientific sense, and it is crucial that any 'reductionist' research is avoided. It is for this reason that a multi-casual and eclectic research framework has been adopted.

In order to measure the student response to studying in Higher Education, efforts have been made to closely analyse each individual student approach to studying, and the associated intellectual development via in-depth interviews combined with the use of appropriate tests and questionnaires. Information obtained from these sources are used to develop, update and redefine existing theories on student intellectual development (Perry, 1960), and the more specific theories on student withdrawal and failure (Tinto, 1974; 1982) with the aim of creating a new eclectic theory which will assist in the identification of students 'at risk' before underachievement, withdrawal or failure occurs. Appropriate mechanisms for their remedy are proposed.

The aim of this study is to collect and interpret information on the various academic determinants that may influence success or otherwise in Higher Education, leading to the identification of performance indicators.

The ultimate objective has been to identify 'at risk' and vulnerable students by:

- the collection of all available data on each student employing various tests and questionnaires;
- identifying potentially 'successful' and 'unsuccessful' candidates;
- determining what 'type' of students are at a greater risk of underachievement, of withdrawing or failing their course.

Various strategies and changes in the teaching delivery and course structure of the degree programme (which will help the students to meet their changing expectations of life in Higher Education) are identified and recommended. Particular reference is made to possible changes in teaching and learning strategies, the delivery of the degree programme, the provision of better study skills tuition and a clearer explanation of what is expected of the student at the outset, with supporting reasons.

Student data has been collected on: entry qualifications, age and level one, two and three examination results for each semester where applicable. As a result of this, a further examination of the relationship between previous academic achievement (eg. A'Levels, BTEC, City & Guilds etc.) and academic performance (for each semester) at university was conducted during the first year of the study. The outcome of this research identified an insignificant relationship between academic performance before entry into Higher Education and academic performance at Level One. This provided further evidence that information obtained at the selection stage cannot be relied upon as the sole indicator of potential success or failure in Higher Education.

In addition to the student data collected at entry, a diagnostic mathematical test was given to Level One students during induction week to diagnose individual strengths and weaknesses in numerical ability. The main aim of this test being to identify those

students who may experience difficulties with basic mathematics, considered essential to successfully undertaking some of the more numerically based subjects, and subsequently providing the appropriate remedial tuition as part of the Level One programme. The diagnostic mathematics test did identify a number of significant weaknesses in the students' experience and knowledge of essential fundamental mathematical concepts required.

Individual student profiles for selected students were constructed from this information and their movement within the class profile was identified. It became evident that where a majority of the class appear to work steadily through their course, others experience either a decline in their progress or a marked improvement in their examination performance. This information provides only a starting point in explaining why some students do well and why others experience difficulties. It was evident from this that more detailed questioning of a number of students was required to provide some of the missing detail in relation to their academic performance on the course.

At this point, it is necessary to construct a mechanism for diagnosing those students 'at risk' and to explain *why* a student becomes 'at risk'. The second part of this research project presents a composite theoretical model of student academic performance in the form of a predictive tool by:

- investigating student intellectual development;
- investigating the impact of the student approach to studying and learning;
- identifying those students with serious weaknesses in knowledge and skills at entry (e.g. in mathematics and general study skills);
- investigating individual student motivation and the level of commitment to the course.

Subject to these findings, each student will be identified and classified according to a 'student type' . The aim being to identify 'at risk' students and also potentially very successful students according to set criteria in response to the findings from individual student data, tests, questionnaires and one-to-one interviews.

It is intended that by constructing a composite set of models within one broad theoretical framework, a clearer description and explanation of the process of student withdrawal emerges. To achieve this objective, an identification of the critical points during a student's academic career, where he or she is more likely to be 'at risk' of withdrawing or failing the course, is developed from the individual student profiles linked with an inventory on the student's approach to studying and a inventory to identify the level of intellectual development. In addition, student academic performance is continually monitored on an individual basis and recorded in the form of an individual performance profile alongside other findings obtained through tests, questionnaires and interviews.

Ultimately, the research seeks to recognise and make an allowance for the nature and complexity of interacting factors and other indicators involved in this study. As with other earlier models on student withdrawal and failure, the model constructed as part of this research cannot be designed to account for all the variations in the reasons explaining *why* a student may be 'at risk'.

1.2 Focal Theory

1.2.1 Statement of the problem and the purpose of the research

The topic of student academic performance, and more importantly non-performance or under-performance (student wastage and underachievement), is very likely to become an important issue in Higher Education in the next few years as educational policy and funding shifts from the traditional base to a new one. The need to reduce student wastage and increase student academic performance (i.e. to provide a better and 'value added' education) will become more acute as each Institution in Higher Education strives to compete for ever decreasing resources. The study of student wastage is important for three main reasons: student wastage is costly - to the INSTITUTION in the loss of revenue (course fees) and in reputation; it is costly to the STUDENT in the form of financial cost and 'psychological' loss and to the SOCIETY in the form of the social and financial investment put into Higher Education through taxation and general effort (Johnes, 1990).

Previous research into this area has tended to focus on collecting descriptive data on the factors which determine success or failure and many current research projects still carry this overall emphasis. However, Tinto (1974 & 1982) recognised the need for an alternative approach which studies the underlying *processes* which determine academic achievement in Higher Education. In addition to this, a more qualitative approach is also required which may yield data which sheds more light on the interaction between the factors which cause student non-completion (Leitch, 1994). A main objective of this research will be to study the *critical processes* which determine success or failure and to identify the *critical points* which mark the beginning of such processes.

It is widely recognised that no well-developed or grounded explanatory framework that identifies the *causes* of non-completion exists at present. It is therefore a central aim of this research to develop a theoretically based investigation of the interactions between academic and personal factors such as intellectual development, course structure, academic integration, commitment, motivation and academic background. The outcome of the research will be to present a multi-causal explanatory and predictive model of student non-completion.

The purpose of this research, therefore, will be to redefine the existing theories presented by Tinto and Perry to create a new eclectic model describing and explaining the whole spectrum of student academic performance in Higher Education. It is intended that this will in turn shed more light on the problem of student underachievement, withdrawal and failure.

1.2.2 The problem of definition in studies of non-completion

The literature refers to student failure or referral, voluntary withdrawal, academic transfer (to another course or university) and underachievement through its many interpretations. To illustrate this, Johnes & Taylor (1990) list a wide range of terms used in the literature to describe student non-completion: 'student wastage', 'non-completion', 'non-graduation', 'nonpersistence' and 'attrition'. Again it must be noted that these are broad terms used to encompass all forms of student failure and withdrawal from university. To break this down, the term 'voluntary withdrawal' is

probably the best term to describe those students who leave university at any time during their academic career either permanently or temporarily for reasons other than academic failure. Elton (1968) uses the term 'drop-out' to describe a student who has left university without taking the degree, yet this reflects the student's decision to leave as a matter of choice. Involuntary withdrawal or failure, however, is clearly different. This is when a student has been asked to leave because of poor academic progress or examination failure. An earlier term for involuntary withdrawal was 'academic dismissal', but more recently the term 'referral' has been used to describe a student whose academic progress is not satisfactory, and the decision to fail the student has been delayed. In addition, it is also easy to 'lose' the students who do not actually fail, but transfer from one course to another or from one university to another before they complete their degree course.

In recent years, the quality or 'value-added' quality of a *higher education* experience has been questioned. It is therefore important to add at this point that student achievement should ideally be maximised. The term 'underachievement' signifies a student who has not received or fulfilled his or her own potential while on the degree programme. However, the identification of an underachieving student may be difficult.

1.2.3 The definition of academic performance and success

Academic performance can be defined as having two different meanings, namely either *academic achievement* (i.e. average marks) or as a *measure of progression* from one level to the next. However, the two different meanings provide two different views from what is meant by the word success. Academic achievement is an indicator of the level of achievement while progression is a measure of staged completion.

1.3 Higher Education

The increase in participation in Higher Education has led to concerns about the students' capacities to cope with the demands of degree level work. Many students now enter Higher Education from a variety of backgrounds and experiences, both academic and vocational. There is increasing concern that the number of students that may be academically 'at risk' of underachievement, withdrawal or referral may be

growing.

1.3.1 Concept of Education

In general, education is primarily concerned with individual intellectual, social and emotional growth and development. However, *educational research* is a developmental process, concerned with both describing, interpreting and accounting for changes in the relationships between individual physical, social, intellectual and emotional growth expressed as a function over time. A successful experience of Higher Education results in the continuing academic and personal growth of an individual over three or four years, resulting in the completed development of a rounded individual in both the academic and personal sense (Barnett, 1990).

1.3.2 Theories of learning and teaching in adult education

Knowles (1978 & 1988) explored theories of learning and teaching specifically within the field of adult education. The education of adults has been a concern of society for a long time, but thinking and investigating about adult learning has only become important during the last few decades. Many early theories on adult learning tend to presume that adults learn in precisely the same way as children. Knowles (1978 & 1988) uses the term "andragogy". This is derived from the Greek word *aner*, meaning man. Knowles distinguishes pedagogy (literally means the art and science of teaching children) which assumes that children are ready to learn what they ought to learn. Whereas andragogy assumes that learners are ready to learn those things they need to learn. In conventional education, the student is required to adjust to an established curriculum; in adult education the curriculum is built on the students needs and is interested in. Authoritative teaching styles and rigid examinations have very little purpose in adult or higher education. Therefore teaching in higher education is more student centred. At the heart of higher education is learning, not teaching and the focus has shifted from what is taught to what happens to the learner.

Andragogy places greater emphasis on the self-diagnosis of learning and the self-evaluation of learning. This emphasis on learning quality is also important for the institution and there in recent years has been a need for individual institutions to address

and monitor the issues of teaching quality and student satisfaction. Teaching quality, and more importantly, learning quality may be reflected within the levels of academic performance achieved. The issue of underachievement and non-completion in higher education therefore will become more important in future years.

1.3.3 The concept of intellectual and educational development

Throughout three to four years at university, a student's intellectual development progresses through stages of assimilating knowledge, creating a deep understanding; the development of critical judgment; becoming aware of other forms of knowledge; and the eventual realisation that knowledge and experience is relative. From this point, there is a further progressive intellectual maturity, whereby a student breaks through relativism and critical thinking to attain a position of creative independence. However, progressive intellectual maturity is far from being a purely philosophical phenomenon. The work by William Perry on student intellectual development is a detailed analysis of student development based on considerable empirical work done in the USA in the 1950's and 1960's (Barnett, 1990).

All learning is initiated by an experience of learning, and if successful results in:

> ..."a long-lasting change in knowledge, attitude or skill, acquired through experience." (p.153, Rowntree, 1981).

This learning experience will bring about a change in the individual. If this learning experience is dynamic; it should consist of a series of progressive intellectual, social and personal challenges throughout a three or four year degree programme. Changes noticeable in the individual are likely to be gradual, but marked for each stage of the degree programme or through each identifiable stage of development. The outcome of each learning experience is likely to be permanent, manifesting itself as a distinct change in behaviour, attitude, intellect or skill (Egan, 1983).

1.4 Higher Education in context

1.4.1 History of educational policy and change in Higher Education

In the report of the Robbins Committee in 1963, the responsibility for research into

student wastage was firmly placed upon the universities. The Robbins Report called for a,

> ..."full and continuous enquiry as part of the universities' proper concern for the progress of all students..." (p. 192),

but more importantly this concern should be located within each department or faculty,

> ..."it should be an essential part of the responsibility of any university department towards its students to investigate this problem carefully..." (p. 191).

This is in contrast to recent Higher Education Quality Council reports which state how badly universities have performed in evaluating the quality of their education. Woodrow (1996) also sees withdrawal and failure as the responsibility of the organisation or university. An effective organisation is one which is oriented towards its customers (students). However, in Higher Education this is still far from the case, as can be seen from the continual use of the terminology of withdrawal and failure. If the students are to be seen as the 'clients', the terminology of withdrawal and failure is inappropriate. Clients, and therefore students, do not 'drop out', they are lost and that can be argued as being due to negligence on the part of the university. In universities, the blame for non-completion is still placed on the student rather than the organisation's shortcomings such as reduced tutor contact, general teaching quality, pastoral care and the quality of student accommodation and the general lack of resources.

The Robbins' Report added that in 1963 no real insight had been achieved into the weighting each factor actually had in determining success or failure. The "full and continuous enquiry" asked for by the Robbins Report outlined the main factors to be considered: the lack of intellect, the lack of student application and determination to succeed, defective teaching, psychological difficulties faced when adjusting to university life, or personal problems associated with student life. However, it is debated whether any meaningful research has been undertaken along the lines set out by Robbins in the UK from 1963 to the present day.

In 1963, the Robbins' Report stated that ..."courses of higher education should be available to all who are qualified by ability and attainment to pursue them and wish to do so." Words supported more by rhetoric than implementation until the late 1980's

when a recent government policy initiative called for a widening of access to Higher Education to reach 14%. However, the current widening of access to Higher Education may not properly account for the increased difference in background in student ability and attainment prior to entry. This problem is likely to have been exacerbated in those institutions where there has been a tendency to admit students with lower than 'standard' entry qualifications in response to this initiative.

In recent years, Higher Education has seen a dramatic expansion in student numbers through the late 1980's and early 1990's in response to changes in government policy on Higher Education. Access to Higher Education has become more widely available compared to the pre-1980 British educational system which was exclusive and discriminatory on the grounds of class, gender, and age. At this time entry into HE was restricted to only 12.5% of the 18-19 age range. Entry at this stage was highly selective, staff-student ratios were favourable, resourcing was high and class sizes were small or based on the Oxbridge tutorial system. Withdrawal and failure, as a consequence, was very low. However, since the late 1980's and early 1990's, widening access and substantial increases in student numbers have increased the potential for higher non-completion rates. To ensure the effectiveness of wider access to HE, it is necessary to look beyond admission and examine what factors contribute to retention (Benn, 1995) as well as those which determine non-completion. The implications of failure could disadvantage an individual further than one who had not had the opportunity to enrol on a degree programme.

1.4.2 Thirty years after Robbins to the Dearing Report of 1997

The British participation rate in Higher Education increased from 4.5% in 1958 to approximately 14% in 1988 and a projected 30% by the year 2000. This growth of non-completion was in direct response to an increase in demand for university places as increasing numbers of young people stayed on at school and thereby become 'qualified' for admission into Higher Education. The rapid expansion of the Higher Education system since the 1960s has therefore been largely achieved without any alteration in the 'standard' for entry of two Advanced Level General Certificate in Education qualifications or their equivalent. This is an exact response to the Robbins'

Committee Report of the 1960s which called for the expansion in provision of courses in Higher Education to be made available for those qualified by ability or attainment and who wish to follow a course of further study. However, since the late 1980s, researchers of Higher Education have become increasingly concerned that the number of students entering university with non-standard entry qualifications (other than the traditional A-Level GCE) is on the increase. As a consequence, there is a growing suspicion that these students entering university with 'non-standard' entry qualifications are more likely to withdraw or fail during their first semester at university.

There is no agreement in the literature about the extent of the problem of non-completion in the UK. Leitch (1994) indicated that the rate of non-completion is around 14%, however, the average rate varies between different disciplines and universities. The problem is more acute in Scotland where the rate of non-completion is 4 to 5% higher on average than in the rest of the UK (Johnes & Taylor, 1989; Leitch, 1994). This higher non-completion figure is attributed to the length of some Scottish degree programmes which are generally of four years duration compared with three year degree programmes in England and Wales and the age of enrolling students in Scotland at 17 years, a year earlier than the rest of the UK. In 1994 a Committee of Vice Chancellors and Principals' survey in 1994 claimed the rate was around 13%. A more recent report by the CVCP indicated a 10% rise in non-completion to 54,000 students in 1994/95 to 23% (HEFCE, 1997).

1.4.3 Recent educational innovation and change in government policy

Higher Education has been influenced by many recent educational innovations, policy decisions and economic constraints which are producing new experiences for students and staff. All of these add potential factors which may contribute to the quality of the overall student experience. Major developments include: a significant expansion in student numbers; abolition of the binary line between the original universities and the polytechnics; an increase in part-time and non-traditional entrants; modularisation and Semesterisation and the freezing of grants and the introduction of student loans.

More recent moves have been made to consider teaching and learning quality in Higher Education with the introduction of the Students' Charter and the TQA process first led by the HEQC and now the QAA. Greater emphasis on quality as defined by how many students pass and how many pass well, may become an important issue. High non-completion rates will therefore become increasingly undesirable in the future as individual universities compete for limited resources as well as proving the quality of their degree programme on offer and the degrees awarded. The motivation to study is now different than for previous years; increasingly, students are driven by the employment prospects of a degree programme than for the intrinsic and personal satisfaction of academic study in itself.

1.4.4 Projection for a future Higher Education - tomorrows students?

This is evidenced by the increase in students from a humanities background, opting for a vocationally related degree programme such as the Building Technology and Management degree course which is the focus of this study. The last few years have also seen a dramatic rise in the number of mature students. Where the 'young-matures' i.e. those within the 21 to 40 age range may be motivated in terms of studying for a new career. The 'mature-matures' or the late 40 to 80 year old may remain motivated towards studying for pleasure or as a hobby.

However, future students will be self-funding and more likely to be mature, studying part-time, registered at a local university and living at home, aware that the future job market will not guarantee them a 'graduate job' and looking for degree flexibility and transferable skills. More importantly, the future student population will be actually aware of their position as a *'purchaser'* of Higher Education - expecting comprehensive subject content and high quality of tuition (King,1996). At the present time, the importance of quality control is only recently emerging within institutional thinking and implementation. Within the next five to ten years, each institution will need to address and monitor the issues of teaching quality and student satisfaction and this may well be reflected within the levels of academic performance achieved.

Chapter 2. Literature Review

2.1. Introduction

The literature review has addressed the following areas associated with this study:

(i) student withdrawal and non-completion in Higher Education;
(ii) student learning and intellectual development;
(iii) student approaches to learning.

A substantial body of literature exists on the subject of student failure, withdrawal and non-completion or student 'wastage' in Higher Education. Much of this work is from the United States of America with very little work produced on student failure in the United Kingdom. It is salutary that the problem of student non-completion in the United Kingdom has largely been ignored by British Universities and educational researchers. Early work on student non-completion in the UK began to appear around the post-war period, research on the subject of student non-completion generated little interest in British universities despite a steady non-completion rate of around 13% on average per year since 1957 (Robbins, 1963; Johnes & Taylor, 1989; Johnes, 1990). Student non-completion rates also indicate an upward trend. These statistics have been based on figures from 1992 and 1993 which indicate a withdrawal figure of 13.2% and 13.3% respectively (PUSH, 1995 & 1996). The reason for this is clear. In the United States, student non-completion has always been a major problem with non-completion rates particularly high at between 40-60% per annum (Robbins, 1963). In the United States, unlike in the UK, parents and the students themselves tend to want explanations about their academic performance especially in cases of failure which leads universities into having to defend their decisions as such cases often lead to appeal. Therefore in comparison the problem of non-competition in the UK is less apparent and perceived as relatively unimportant and this partly justifies the lack of attention it has received in the

past. More interestingly, the subject of student non-completion or student wastage is a recognised and complex process. Many direct and indirect factors combine to determine whether a student is successful in Higher Education.

Most of the work on student wastage in the UK dates from the early to mid 1960s; coincidentally this time is also significant to the UK with the publication of the 1963 Robbin's Report on Higher Education. Literature on student academic performance, and especially student non-completion in the United Kingdom, tends to appear in tandem with government policy changes. In 1963, the Robbin's Report on Higher Education was followed by an intense research effort well into the early 1970's. This includes the work by: Elton (1968), Wankowski & Prince (1969), Miller (1970), Spady (1970), MacKintosh (1971), Spady (1971), Wilson (1971), Wankowski & Cox (1973), Cox (1974) and Tinto (1975).

Further research did not begin to appear until the mid 1980's as interest in student academic performance mounted in the wake of recent government policy changes and an ever increasing interest in the 'cost and benefit' or 'value-added' benefits of a *higher education.* This includes the work by: Tinto (1982), Oldham (1988), Johnes & Taylor (1989), Van Overvalle (1989), Cryer & Elton (1990), Johnes (1990), McPherson & Paterson (1990), Parsons & Meyer (1990), Entwistle, Meyer & Tait (1991), Mallette & Cabrera (1991), Leitch (1994), Meyer & Parsons (1994), Benn (1995), Cliff (1995), Elton (1996) and HEFCE (1997).

The study of intellectual development begins with the work by Jean Piaget on child development. However, the study of intellectual development in young adults lies within the domain of Lev Vygotsky and Lawrence Kohlberg, but the intellectual development of students has only been presented in a comprehensive form by Roy Heath and William Perry in the United States although Erik Erikson did briefly refer to this in his work.

2.2. Historical trends in student non-completion

One of the first notable British papers on the subject was written by Wankowski &

Prince (1969) who conducted a quantitative survey using data from the University of Birmingham from 1964 to 1967. The survey focuses on undergraduate wastage in the wake of the Robbin's Report of 1963. The study introduces a Cohort Method to account for wastage rates and investigates the factors which affect the performance of students at the University at the time. The research project investigated the factors which contribute to success or failure using a long range investigation of a sample of students. Other shorter projects focused on study difficulties, and student attitudes to teaching and learning. An additional survey by Wankowski & Prince (1969) investigated the effects of student personality on academic achievement. The investigation studied 98 withdrawing students who left after failing their examinations at the end of the academic year 1964-65. As a result, 35.7% left due to academic difficulties and 40.3% simply lost interest. Interestingly, Wankowski & Prince (1969) noted that for 32% of all voluntary withdrawals that occur just before sessional examinations, for all three years: 29.1% had medical problems, 29.1% had psychiatric problems and 25.0% personal problems. Wankowski & Prince (1969) also noted that the students who do withdraw have significantly higher A' Level results than the remaining student population.

The survey further attempted to identify weak or 'at risk' students by interviewing all those students who have dropped down in their examination scores. Thirty-seven students out of a sample of 61 were regarded by their department as being 'at risk' of failing. Out of this sample: 67.5% said they had problems in studying, 22.6% had difficulties with accommodation, 19.4% had family or personal problems at home and 19.4% were overly encouraged to enter Higher Education.

Student non-completion - 1970's

Cox (1971) studied trends in undergraduate non-completion over a six year period from 1964 to 1970 also at the University Birmingham. This research project was conducted in a similar manner as in the previous study by Wankowski & Prince (1969). Cox noted that the level of non-completion at the University of Birmingham ranged from 5.4% to 6.4% in 1966-67. In more detail, Cox compared non-completion rates with student term-time residence types and noted that students who live in privately rented

accommodation were more likely to withdraw compared with students living in halls of residence on campus. Cox also considered the effect of socio-economic background and parental occupation upon the non-completion rate. In conclusion, Cox noted that the non-completion rate for students from professional backgrounds was more likely to be higher than average in comparison with students from skilled or unskilled backgrounds who were more likely to be below the average. However, it is noted that students from lower socio-economic groups were under represented in Higher Education at this time in the 1970's.

Of greater significance for this research is Cox's report in 1971 on the non-completion rates by year of course - the longitudinal profile of non-completion. Non-completion rates were at their highest in the first year, falling considerably in the second year and again in the final year. In the first year, 10% of students enrolled for that year did not complete the year. Cox also reported a difference in non-completion rate between the sexes, noting that the rate was higher for males than for females.

However, the report by Cox (1971) is typical of the type of enquiry made into "Student Progress" and student non-completion at the time. Although it is factual, it is also very descriptive and provides only a measurement of the magnitude of the problem of non-completion and failing academic performance.

Wankowski & Cox (1973) conducted a similar research programme investigating the correlation between student temperament and self-motivation and their effects on academic achievement. In the study, they noted that failure at university can be associated with a polarising phenomenon of either a lack of confidence, or an excess of confidence in one's abilities and consequently an unrealistic projection of future short and long term goals. Eventually, this may lead to poor planning or even a complete rejection of any future planning. It is recognised that over-ambition can be equally damaging as under-ambition. Tinto (1974) also stresses how important student expectations of the future and their future career aspirations are in determining how well they progress at university.

Wankowski & Cox (1973) referred to the transition between secondary school and university as a 'pedagogical gap'. Here it is noted that pre-university students are often restricted and therefore over-compliant on one particular teaching and learning style (passive, one-way lecturing or straight forward dictation) and the more traditional forms of assessment (written course work and examinations). As a result, many students come to university and expect to be taught in much the same way as before. This is a stark contrast to the more detached mode of tuition and individual study required at undergraduate level. Wankowski & Cox (1973) suggest that there is a correlation between students who at school were over-dependent upon the teacher for guidance - those suffering from a kind of 'spoon-feeding syndrome', and failure at university. This supports the work by Perry who uses "dualism" as a stage to describe this transitional stage in development.

The most significant contribution to the study of student motivation at a United Kingdom university was provided by MacKintosh (1971). The word 'motivation' however, means many things to different people. Psychologists see it in two ways: the *cognitive psychologists* see motivation in terms of drives, needs and wants. Whereas *behaviourists* talk of a response by the learner following on from an incentive whether it be *intrinsic* or *extrinsic*. The study conducted by MacKintosh at the University of Aberdeen specifically focused on student examination failures. The University of Aberdeen set up a Student Progress Office in 1969-70 with the aim of providing an 'early warning' system and information service for students who are 'at risk' of failure. MacKintosh (1971) noted in her study that in 1970, 18.0% of first year undergraduates in a pure sciences degree programme appeared to be in serious academic difficulty after the December examinations. On investigating the factors which contributed to this problem, MacKintosh noted three main problems: a lack of motivation, difficulties in making the transition from school to university and an inability to organise and to balance the demands of a heavy timetable of lectures and tutorials with private study. In year two, 14% of students appeared to be in difficulty after December.

In conclusion, MacKintosh (1971) showed that a lack of self-motivation and genuine interest in the subject studied was the primary factor in determining failure.

MacKintosh (1971) notes that high first year failure rates will continue to remain high as long as sixth-formers are allowed to automatically and unquestioningly proceed to university without proper counselling and advice. Many arrive at university ill-prepared for life at university, and are unaware of the changes about to take place. Significant changes include those relating to the social and academic environment, attitudes, and teaching and study methods. This supports the view that the problem of potential student failure begins long before the student actually arrives at university.

It is interesting to note at this point, that previous work undertaken on student non-completion has been associated with the 'old' traditional university and excludes student data from the 'new' universities. At the outset, the polytechnics were given a brief to specialise in teaching support, but were discouraged from developing a research base, so they could not easily research the area of their own teaching and learning, the area they were best placed to actually research in.

Rump & Greet (1975) attempted to determine whether withdrawals reflected a fault of the institution or a limitation evident in the student. Their study examined the motivations of students who withdrew from the University of Adelaide in Australia noting that withdrawing students see very little value in academic work. This indicates that withdrawing students are poorly motivated with little or no academic ambition. From their study, they discovered that 6.9% of new undergraduates withdrew during the study, but no actual dates for the study were given so it is assumed that the study took place in the first part of the 1970's. Three methods were used in order to collect data about the group: recorded information, questionnaires and psychological tests. In the study, it was noted that a far greater proportion of part-time students withdrew (12.5%) compared to full-time students (4.3%). The questionnaire asked withdrawing students to indicate their reasons for withdrawal in a checklist covering five broad areas: financial, alteration to lifestyle, difficulties with employment, problems with studying and university lifestyles and personal reasons. The psychological tests were designed to test levels of anxiety, study habits and motivation. This took the form of a series of four tests given to a sample of 28 students. The reasons for withdrawal for new undergraduates were divided into six primary reasons: 14.7% financial, 11.8%

life circumstances, 8.8% ill health, 14.7% employment, 50.0% studying difficulties and none for personal reasons. In conclusion, it is clear that students withdrawing in the early stages of a course have distinct studying difficulties, indicating that academic ambition may be present, but ability is lacking. Tinto (1974) further suggests that voluntarily withdrawing students tend to be, comparatively, more able and intellectually gifted. They also tend to be from a higher socio-economic status than other persisters. Conversely, academic dismissals tend to have a lower aptitude and a lower level of intellectual development in comparison.

A more important 'student factor' is the level of academic ability and intellect possessed by the individual student. Past educational experience may have an important bearing on the potential success or failure of the student in the future. Elton (1968) noted that a student with high A' Level scores is more likely to get some sort of degree than one with low A' Level grades. Students with low A'Level grades do not perform substantially worse at degree level than those with higher A' Level grades. The entry standards of students varies between different institutions of university status. A' Level results may indicate future academic potential of a student, but they do not necessarily guarantee success (Bligh, Caves & Settle, 1979). Miller (1970) noted that the first year performance is probably the best indicator of final degree performance rather than A' Level scores. Finally, Elton (1968) concludes that attainment at university is dependent upon the idiosyncrasy of the university and not necessarily on the ability of the student.

Malleson (1978) provides a further dimension by focusing more on the personal or emotional factors which determine academic achievement in Higher Education. During the 'integration phase' Malleson (1978) notes homesickness, social awkwardness, psychological and social impediments and problems with studying to be the main factors which determine the level of success during the First Term in the First Year. In the Second Year, studying difficulties become the main problem, not examination difficulties. Malleson (1978) divides study difficulties into two: primary and secondary. The primary problems include: working inefficiency, poor study habits, disorganisation, poor recall and retention, and problems in producing work for

assessment purposes. The secondary problems include: unhappiness and stress (typically associated with relationships, finance and accommodation). In this case the student is preoccupied with the unhappiness this causes and as a consequence becomes ineffective in studying.

Student non-completion - 1980's

Van Overwalle (1989) looked at the problem of success and failure of students attending the Vrije Universiteit Brussel, in Belgium. Van Overwalle (1989) outlines the main determinants of academic achievement from existing literature on the relationships between student/environmental characteristics and educational achievement. The first of these is past academic performance and academic ability. Van Overwalle states that the overall secondary school performance is the single best indictor of later academic performance - a view not always shared by other researchers (Sear, 1983), except for a consistent finding that those with top school or college of further education grades are more likely to get a first class honours classification on graduation at university. Secondly, Van Overwalle looked at social-economic factors and studied the relationship between social-economic status and degree performance. Thirdly, Van Overwalle considered the effect of perceived causality related to the *locus of control.* This theme, *locus of control,* will be discussed later in this chapter. This can either be intrinsic or extrinsic. Fourthly, Van Overwalle looked at motivational factors. The final determinant relates to the style and the range of learning strategies adopted by the student.

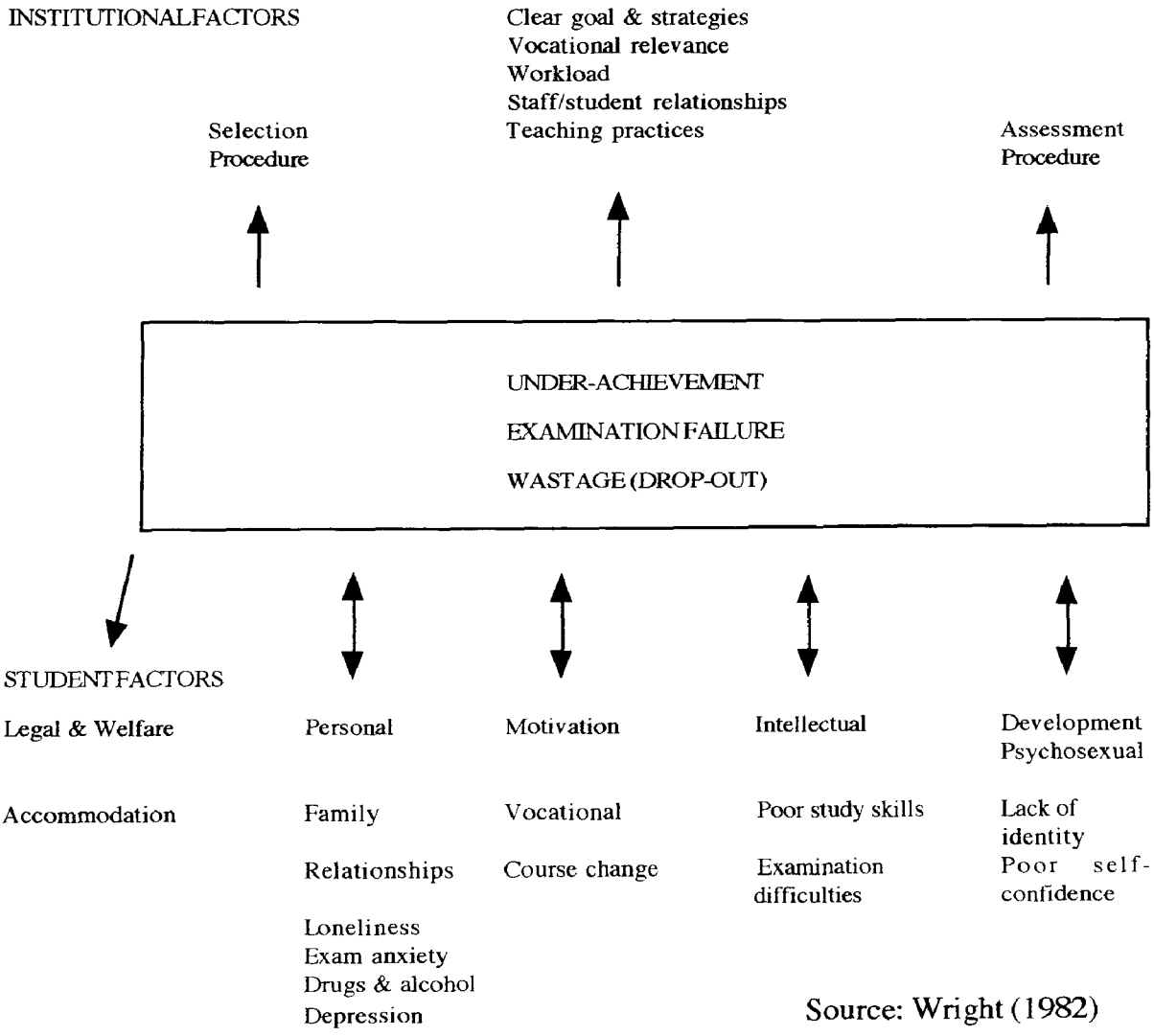
However, he does point out that *social relations* at university can be related to academic achievement. For example, good informal contact with peers and academic staff provides the student with important psychological advantages. Van Overwalle (1989) also states that good social interaction can indirectly influence study performance by developing a sense of 'belonging' within the student. This is supported by Jean Piaget and Lev Vygotsky who claimed that educational and intellectual development evolves due to social interaction and communication. However, it is argued that too much social contact with peers and lecturers may be detrimental to educational growth and development. For example, personality clashes,

blatant favouritism, preferential treatment of one student against another, and general overfamiliarity with staff members may actually be harmful to certain individuals and as a consequence, detrimental to overall academic performance and personal satisfaction of the whole educational experience.

Wright (1982) uses a systems diagram in her description and explanation of the main factors that determine student academic performance (i.e. under-achievement, examination failure and drop-out).

Figure 1

The Institutional and Student factors that determine achievement



Source: Wright (1982)

Sear (1983) notes a generally non-significant correlation between A' Level GCE grades and degree results. On considering the overall correlation between A' Level and degree results, between subject area and between students of different ages, Sear (1983) rightly notes that mature students tend to have lower entrance grades in all subject areas, but are more likely to have other additional qualifications and more work experience. In general, lower A' Level grades are not reflected by corresponding inferior degree results. Sear (1983) also concluded that mature students tend to do slightly better irrespective of their A' Level or entry qualifications in the arts based subjects. Relatively this implies that mature students are weaker in engineering and science subjects. Sear (1983) calls for more evidence to show that institutions are compensating for relatively poor entrance qualifications by means of adopting more intensive teaching methods in the teaching of undergraduate students. This is particularly important where the class is predominately more mature or lacks traditional qualifications for entry.

Work by Johnes & Taylor (1989) also addressed the issue of degree non-completion in the UK. One main factor they cite for this is scholastic or academic ability. When investigating the reasons why there is a considerable variation in student non-completion across British universities, they provide some evidence that there is a correlation between A' Level scores and the final degree performance. The higher the A' Level score at entry for the University, the lower the non-completion rate for that University. However, the work on the correlation between pre-entry results and degree results is conflicting. Sear (1983) provided a study which suggests that there is a weak, but positive correlation between A' Level results and the final degree result from data collected in 1979. Johnes & Taylor (1989) and Johnes (1990), however, produced a near perfect correlation at +0.98, but on closer examination of these results it is apparent that the statistical method used in each case varies quite considerably from the work by Sear (1983). Johnes & Taylor (1989) and Johnes (1990) only use figures taken from the student population who gained a first or upper second honours classification and then correlated their results with their A' Levels.

De Rome & Lewin (1984) suggested that student withdrawal and failure is a recognised

and complex process. De Rome & Lewin (1984) agree that this process may start well before a student reaches university. Their contribution to the literature raises the point that a smooth transition from school to university may be hampered by poor motivation related to ill-advised course choices and enrolment decisions made at the outset. Persisting students are usually more positive about their courses and what they are doing and what they want to do in comparison to students who eventually withdraw.

To illustrate this, De Rome & Lewin (1984) discovered that at the end of 1980, out of the number of first year students who failed, only 49% of them were in the institution of their choice and on a course of their choice. Twenty percent said they were not in an institution of their choice and 56% said they would leave university if they were offered a good job. Oldham (1988) suggested very strongly that the institution is responsible for student non-completion to some extent. This suggests that universities have had a tendency in the past to ignore the needs and problems faced by students as they arrive and settle into the university. Oldham (1988) also accuses the institution of expecting students to fend for themselves and to stand on their own two feet and thereby ignoring some of the difficulties they face as they adjust to a new life and the type of work expected of them at university. Oldham (1988) suggests that institutions are 'failing' their own students long before any real assessment takes place by failing to develop a sense of belonging to the course or the university; by failing to help students adjust to the type of work expected of them at university; by failing to provide proper induction programmes and by failing to provide adequate academic counselling and study skills support and guidance.

Further interest in student academic performance does not reappear until the late 1980's. At this time, the literature takes a more focused stance and the work of this time focuses upon either "cross-universities" focused studies of student non-completion (Johnes & Taylor, 1989; Johnes, 1990) or small scale studies which look at a controlled number of possible factors which determine student academic performance at university (Sear, 1983; De Rome & Lewin, 1984; Oldham, 1988; Van Overwalle, 1989; Cryer & Elton, 1990; Entwistle, Meyer & Tait, 1991; Elton, 1996). During this phase in education research, specific works appear in an attempt to identify students 'at

risk' of underachievement, withdrawal and failure (Leitch, 1994; Cliff, 1995; Meyer & Parsons, 1994).

De Rome & Lewin (1984) concluded in their paper that student motivation is the most important factor determining persistence at university. It is important to qualify what is meant by the word 'motivation'. In itself, the word 'motivation' can be interpreted in a variety of ways. In psychology, *Cognitive Psychologists* see motivation in terms of drives, needs and wants, whereas *Behaviourists* talk of a response by the learner following on from an incentive whether it be *intrinsic* or *extrinsic*.

Persisting students are far more positive in their approach to their course, their future and life in general. Conversely, withdrawing students will often try to justify their withdrawal from university life by claiming that they were never interested in what they were doing and therefore never fully committed to the university.

Villella (1986) identified two types of educational environment within the university. The educational environment is composed of both a macro and a micro-environment. The macro-environment consists of elements that are external to the university, but which have an impact on the individual student. The institution and the academic community does not have any real control over the variables in this environment. The micro-environment, however, is internal and consists of a unique set of individual student characteristics. Villella (1986) argues that an equal examination of both environments needs to be made before a more effective understanding is obtained about student non-completion.

Researchers have suggested numerous reasons for student non-completion, as well as pointing out the various times at which this process tends to take place. In American studies, the transitional period from freshman (Level One) to sophomore (Level Two) is often presented as the most crucial time in the institution's retention efforts. In comparison to the UK, the crucial time for withdrawal and student loss is during the first week or month of the first year at Level One (Villella, 1986).

Student non-completion - 1990's

Johnes (1990) also considered student socio-economic and educational background in her search for a determinant of success or failure at university. Johnes (1990) noted that the academic difficulties experienced at university may not be a result of any lack of intellectual ability, but simply from a lack of good pre-university schooling. It is argued that students from traditional grammar and independent schools are provided with a better training for life in higher education than students from other types of school background. This again supports the contention that students from higher socio-economic groups are also more likely to receive a private education which is arguably superior to state provided education and one which will provide them with a better start, in terms of study skills, as they start university. Johnes (1990) looked at 'the determinants of student wastage' and largely focused her work on four main factors. One of these being the student's ability to succeed as reflected by A' Level results. Johnes (1990) suggests that selection based on past academic performance is not necessarily the best way to ensure success at degree level and thereby reduce failure.

Wankowski (1991) reports on his research findings that academic failure is associated with a lack of confidence, unrealistic perceptions of the student's own ability, emotional instability, over dependence on teachers and lecturers and disenchantment with the curricula and the demands of academic study. Wankowski is particularly concerned with the experience students face when they embark upon their new academic career at university. It is a difficult time of transition for many students who move from an obvious, but seldom acknowledged, dependent home and school lifestyle, to a free and independent lifestyle which is often influenced by a lonely academic existence and repressed apprehension. In terms of the student's learning, Wankowski noted that learning anxiety is skilfully accommodated in sixth-form or at college and masked to the point where students are given the illusion that they are competent and knowledgeable learners. Alternatively, it is only when such scholars meet the largely impersonal and bureaucratic routines of teaching in Higher Education that many of them lose confidence. Clear teaching and learning objectives, close proximity of support from teachers and readily available 'feedback' and personal

support have always been distinct pedagogical features of the sixth-form. In Higher Education the same features are very much less distinct.

Entwistle, Meyer & Tait (1991) looked specifically at student failure and its relationship to the individual student study strategy and perception of the learning environment at university. They found that students who were intrinsically motivated, who adopted deep meaning approach to their studies and who preferred traditional examinations as a form of assessment, and tutorials were well orientated in their studies and tended to do well academically. This was also the case with students who preferred the lecturer to show links to the real world and who wanted examinations to allow them to demonstrate their own thinking and not simply require them to reproduce what they had learnt. They also wanted tutors to encourage student group discussions. More importantly, these students wanted a course that catered for their own interests in relation to the course and an academic programme which encouraged background reading. Students acclimatised to reproducing orientations to their studies adopted a surface approach to their learning. Their motivation to work being sustained by extrinsic pressure and a fear of failure. They preferred lecturers who told them what to do and what to write in their notes. They preferred examinations which could be answered entirely from lecture notes. They preferred tutorial sessions to be passive meetings where the lecturer just reiterated and clarified their lectures and the course content. These students also wanted precisely defined reading lists and references which contained material directly applicable to the questions that were likely to be a part of the examination at the end of the session.

Several researchers have attempted to identify students 'at risk' of withdrawal or failure in recent years. Cliff (1995) interviewed 12 students on an engineering course who were considered to be 'at risk' of failing their degree programmes, noting their individual study orientations. Cliff (1995) approached a sample of first year engineering students studying on an applied mechanics degree programme. In the first stages of his work, Cliff (1995) administered an inventory "School Experiences of Science and Technology" to the first year class, but no actual indication of sample size was recorded. The inventory used is a composite inventory based on Entwistle &

Ramsden's ASI and the Qualitative Inventory developed by Meyer (1988). This inventory was circulated during the registration or induction period and the students were informed of the research study behind its implementation. In the second stage of the research, Cliff (1995), identified fourteen 'at risk' students and targeted these for interview. As a result, twelve students were actually interviewed from a wide range of academic and social backgrounds. The most striking result was that there was a notable absence of any intrinsic or achievement motivation. More importantly, there was a large number (eight) of students from advantaged and traditional backgrounds.

Even with this evidence provided by Svensson (1977) and Cliff (1995), there is insufficient proof to suggest that students who adopt a surface approach to their studying and learning will be at a greater risk of withdrawal or failure and that the identification and categorisation of a surface learner does not necessarily imply that that student will withdraw from or fail his or her course as it is also generally accepted that student assessment performance is *not* related to the student's approach to learning (Beckwith, 1991). In other studies where the score for 'surface' or a 'meaning' approach has been found, no significant relationship between academic performance at degree level and the preferred approach to studying could be identified. If a surface approach is also an indication of a dualistic learner, it becomes apparent that students can equally achieve a good degree by adopting either a surface approach (or as will be discussed later on in this chapter, a dualistic approach) to their studies throughout each stage of their academic career at university depending upon the type of discipline being studied. It is therefore argued that a student can obtain a degree without experiencing any intellectual development and by remaining within the dualistic mode of study throughout the duration of a degree programme, but the actual 'quality' of the degree achieved may be considerably lower for a student who has been identified as being a 'surface learner'.

In Norway, Elkeland & Manager (1992) expressed a growing concern for increasing failure among students in their first semester at university. In their study, they collected data in two ways: by using information in institutional records and by questionnaires. Seventy percent of a sample of 1,651 students answered the

questionnaire. From their analysis of the research literature, Elkeland & Manager play down the role of motivation and prior knowledge as the causes of failure and suggest that it is the differences between studying and learning at school and university which are to blame. To support this, Entwistle (1990) also notes that the explanation for success and failure lies not within the students nor within the teaching quality, but in a complex interaction between the student and the institutional environment. In Norway, universities adopt an individualised way of working and it is this culture shock in lifestyle which may be crucial to the students' academic performance. This is the first potential critical point - the first semester in the first year and the importance of student induction.

From the literature it becomes clear how diverse the interest of investigations and their theoretical frameworks are. Previous attempts have tried to control a problem of magnitude, which this type of research creates, by focusing the work on a clearly defined set of factors. However, it becomes apparent that this loses a great deal of detail. Earlier research in the 1960's tends to be very descriptive and is confined to quantitative surveys of student academic performance as reflected in the wastage rate. Leitch (1994) suggests that a new way forward for this type of research could be found in a more qualitative approach designed to identify patterns of response among weak and 'at risk' students. Tinto (1975; 1982) is also aware of the limitations of his own work and suggests that greater effort needs to be directed towards producing a model on academic performance which identifies the *process* of student withdrawal and failure, and not simply the main reasons or causes of that wastage.

The most recent work on student non-completion has been conducted in 1997 by Professor Mantz Yorke and Professor Jenny Ozga on work commissioned by the Higher Education Funding Council for England (HEFCE). The research looked into the extent, nature and causes of non-completion and concentrated on two focus points. The consortium led by Liverpool John Moores University (Mantz Yorke) examined the reasons for non-completion and the cost of non-completion to the tax-payer. In comparison to Keele University (Jenny Ozga) where this research was primarily concerned with exploring the experience of students who do not complete their degree

and the measures institutions could take to reduce the numbers of individuals who prematurely leave.

The first part of the HEFCE (1997) report noted that non-completion is a complex process. This part of the report identified eight factors:

Table I

(1)	unsatisfactory experience of the course	poor staff support; poor teaching quality; poor course organisation; large class sizes
(2)	location of institution	accommodation problems; dislike of town or city; homesickness; fear of crime; travel difficulties; programme not as expected
(3)	inability to cope with the demands of the programme	programme difficulty; workload too heavy; lack of study skills; stress; poor academic progress
(4)	wrong choice of field of study	programme not relevant to career; lack of commitment; course not what expected.
(5)	dissatisfaction with institution	inadequate computing and library facilities; poor social facilities; institution not as expected
(6)	problems with finance	demands of employment; personal finance; travel problems
(7)	health-related problems	needs a break from education; problems with drugs/alcohol; lack of commitment
(8)	personal problems	emotional difficulties with others; needs of dependents; lack of support from family and students; difficulty in making friends

Yorke (Part 1 of the HEFCE report of 1997) concluded that non-completion was more likely when the students' expectations are not met; when the student finds that he/she has chosen the wrong course and when the student lacks commitment and interest in the subject. The final remit of Part 1 of the HEFCE Report (1997) was to estimate the total cost of undergraduate non-completion in 1994-95. Yorke suggests the financial cost of non-completion for the the year 1994-95 in the higher education sector will be in the

order of between £71.9 to £91million.

In Part 2 of the HEFCE report of 1997, Ozga, using the work of McGivney (1996) identified two types of withdrawal: early and later withdrawal. Early withdrawal arises from: rushed course making decisions, lack of preparation for degree work, lack of appropriate background knowledge, higher workload than expected, lack of study skills (note taking, essay writing), frustrated expectations, difficulties settling into the institution, lack of support and a lack of finance. Later withdrawal arises from: changes in personal circumstances, work-related factors, financial problems, domestic problems, apprehension at returning to study and fear of examinations.

The second part of the HEFCE (1997) report suggests that non-completion is a result of the social process between the student and the institution (preparedness and student to institution compatibility). This interpretation suggests that a better management of the process of social integration could improve the retention rate. This could be achieved by providing more information to students with regard to degree programmes and in the increased responsiveness of staff, both academic and non-academic. HEFCE (1997) suggests there is a need for greater clarification of policy concerning recruitment and the retention of students, especially mature students. On a practical level, early warning systems need to be developed and implemented. This could involve greaterpublication and provision of information on transfer opportunities - internal and external to the institution and referral procedures need to be offered.

2.3 A search for a theoretical framework

2.3.1 Student Motivation and Catastrophe Theory

Elton (1996) demonstrates that student learning should go beyond and even ignore the real demands of assessment, as basically the actual quality and depth of what is being learnt suffers as a result of assessment driven learning. Traditionally, the perception of student motivation for learning held by academics was that motivation just to pass examinations was bad because it is harmful to developing an *actual* interest in the subject studies. Elton & Laurillard (1979) also recognised that it is impossible for students to ignore what they will be examined on and traditionally it has been seen that

examinations unfortunately favour students who put the passing of examinations higher than their interest in the subject being studied.

Herzberg's theory (Herzberg, 1966) states that two factors affect attitudes to work: (a) those which lead to extreme satisfaction e.g. achievement motivation and (b) working or environmental factors or those which lead to extreme dissatisfaction. Moving on from this, Cryer (1988) & Cryer & Elton (1990) reconceptualised Herzberg's theory into a two-dimensional diagram by using the terms 'intrinsic' and 'extrinsic' for the two factors, defining as intrinsic any factor which can lead to high commitment. (Note: Cryer (1988) does not use the word 'intrinsic' in quite that same way as other researchers in this area. The word intrinsic is often used by psychologists to describe a type of motivation.

Cryer's method of conceptualising the factors also makes it possible to add a third dimension, and here Cryer uses the terms 'low commitment' and 'high commitment' which is a much clearer descriptor than motivation. A further two states are identified as 'playing the system' when people may not be really doing the job well, but are treated very well, and 'despair' which occurs when they are treated badly. Cryer & Elton transferred this diagram to a corresponding catastrophe theory surface. The fold in the surface leads to an effect technically known as hysteresis which inhibits transitions across the fold making them violent when that transition does occur. Cryer & Elton (1990) and Elton (1996) developed their ideas from the original works on catastrophe theory by Thom (1975) and Zeeman (1977). Rene Thom was a French embryologist and topological mathematician. More importanly, the work by Zeeman (1977) later applied Thom's catastrophe theory to the social sciences.

Cryer & Elton (1990) and Elton (1996) were the first to relate catastrophe theory to education - Higher Education. They use this theory to illustrate this further, the 'withdrawal' state is where an employee - or student - has opted out and lost commitment, and this is where the employee begins to look for another job or where a student drops out or looks for another course or university either at the same time or later on. This point illustrates the situation where the student has a low commitment to

the degree programme and is therefore particularly susceptible to withdrawal due to low motivation.

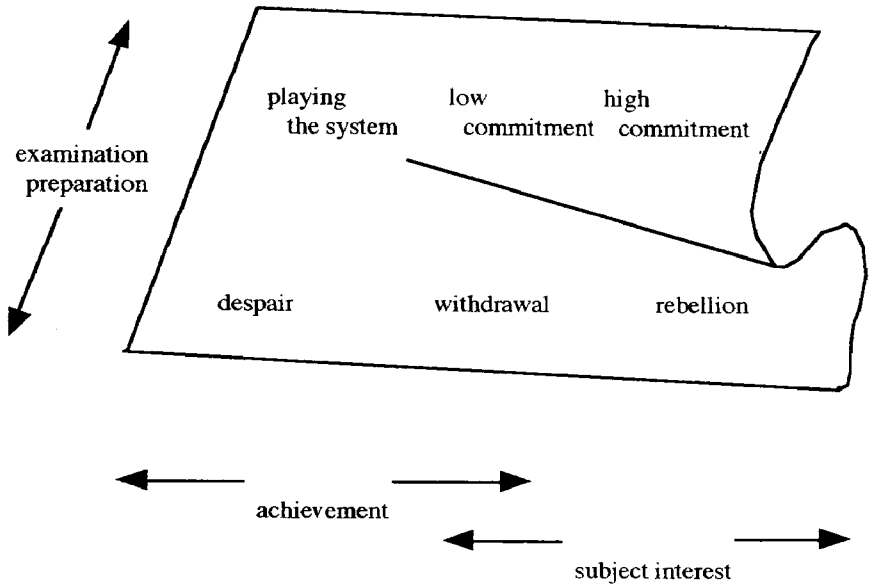
Finally, a term 'rebellion' or 'extreme underachievement' is included which is quite different from 'low commitment' and corresponds to the situation where workers (or students) perceive a conflict between their own intrinsic motivation and their employers' or lecturers' provision of extrinsic motivation (course grades). Cryer then incorporated her diagram with catastrophe theory, a theory which marks sudden and smooth changes in student motivation and the resulting consequences of that type of motivation (Cryer & Elton, 1990). The use of catastrophe theory shows the importance of preventing students from ever reaching a state of 'rebellion' since it creates a situation which is hard to rectify (Elton, 1996). In addition, the work by Cryer & Elton (1990) seems to suggest that it is even more difficult to prevent a withdrawing student from leaving due to the complete loss of any motivation, but a student in the rebellion state may be there due to a fault of the degree programme or the institution and not due to a lack of individual student motivation which cannot be controlled or determined by the institution.

In conclusion, Cryer & Elton (1990) present a qualitative model of prediction and use Catastrophe Theory to model sudden change as a function of time. The main aim of this work is to create a framework which can provide and deepen understanding of *change processes*. However, they are also suggesting that change is sudden, but in reality the decision to withdraw is usually relatively slow and occurs over a long period of time as a result of a short-term error of judgment on the selection of course choice.

The current theory which illustrates educational change and student motivation as presented by Cryer & Elton, 1990 and Elton, 1996 and which incorporates the scientific theory of Catastrophe Theory has been included within this thesis as it is recognised that it may play an important part in the creation of a new model on student academic performance and additionally which explores the extremes of academic performance such as failure, withdrawal and underachievement and success. Cryer & Elton, 1990 and Elton, 1996 also incorporate the thinking inherent in earlier works on

student motivation (Entwistle & Ramsden, 1983; Entwistle & Waterson, 1987; Tinto, 1978; Tinto, 1982). However, Cryer & Elton (1990) take this a step further by incorporating the elements of withdrawal and motivational change in terms of a process or marked event. Cryer & Elton (1990) have not supported their concept with empirical evidence to support their ideas in their explanation of student academic performance and motivational factors.

Figure 2 **Catastrophe Theory and Educational Change**



Source: (Elton, 1996)

2.3.2 The perception of Locus of Control

Locus of control is a psychological term used to describe how individuals perceive a given situation. Locus of control falls into two categories: an internal locus of control and an external locus of control. An individual who believes that he/she has some control over what happens to him/her has an internal locus of control. Those individuals who believe the system controls what happens to them have an external locus of control. An individual with an external locus of control is more likely to believe that the system or institution controls learning and therefore level of academic performance. If this learning is at fault for whatever reason, the student will naturally

blame the institution and its teaching and learning practices.

Research into the subject of locus of control is largely focussed on the study of the relationships between the human perception of locus of control and the various behaviours and attitudes towards studying and learning. As a result, the locus of control has been related to academic performance and achievement. Results show that an internal perception of control tends to be positively correlated with academic performance. Bar-Tal et al (1980) suggest that the perception of locus of control is an important variable which could be used to predict academic success. The view here, is that internal perception of control is related to behaviours which increase the likelihood of successful learning and academic performance.

Locus of control also appears to be associated with anxiety. Anxiety in learning is positively related to external locus of control. If a student's perception is of a lack of personal control over the learning or educational environment, this will induce a certain amount of anxiety and dissatisfaction. In addition, the perception of locus of control can also be related to learning and career aspirations. It has been observed, for example, that students whose locus of control is internal have higher educational and academic expectations and aspirations in comparison with students whose locus of control is external. Students who believe they can control their own learning environment also believe that success depends upon them and not the system. This type of learner will naturally develop into an independent learner given enough time.

To summarise, the higher the locus of control, the higher the academic achievement, the lower the level of anxiety and the higher the level of academic and career aspirations. This idea can also be related to the idea of positive and negative attitude and thinking. A student with a positive view of the world in general is more likely to succeed than one with a negative opinion of the world around them. Bar-Tal et al (1980) confirm in their research the differences between internal and external students. Internal students were found to have a higher academic performance, less anxiety and a higher level of aspiration then external students. The perception of locus of control was therefore found to be a significant predictor of academic achievement. This suggests that

psychological differences between students can, partially, determine the level of academic performance. High anxiety and a low level of personal aspiration can also be detrimental to academic performance. Bar-Tal et al (1980) believe that this type of problem is largely due to a perceived lack of control and understanding of the academic system.

It is therefore concluded that the sense of control over the learning environment is related to academic performance. If a student feels that he or she has some control over the learning situation, motivation and levels of academic aspirations will increase. An argument is developed here which suggests that students should be encouraged to take on more responsibility for their own learning, in terms of the content of what is being taught, how it is taught, the purpose of what is taught and the reward. This supports the view that students need to be given more detailed information, explanation and support in regard to: the degree programme, its rationale and the assessment requirements and procedures.

Martin (1997) studied student examination anxiety experienced by undergraduates studying at Oxford University. Martin (1997) approached 200 students and tested their anxiety levels using a questionnaire to measure long and short-term mood. All students experience some kind of short-term anxiety within one week of the examination period, but examination anxiety is significantly higher in women than men. Men show less examination anxiety close to the examination week than women do 6 weeks before the examination period. Women are therefore more likely to experience long-term anxiety. Martin (1997) notes that women generally possess an academic style which is cautious and less confident than men. It is suggested that men produce essays which are bold and more assertive in style.

2.3.3 A new search for a theoretical framework on progression and retention

Until the early 1970's, research into non-completion in Higher Education was aimed at establishing relationships between the background characteristics which students bring with them to university, and ultimate withdrawal or failure. At this time, all research

was unguided by any explicit theoretical framework (McKeown, MacDowell & Bowman, 1993). The work by Spady (1970; 1971) and Tinto (1975) however provided the first theoretical foundations for subsequent research.

McKeown, MacDowell & Bowman (1993) recognise that further developments of an appropriate theoretical framework are more likely to arise out of an attempt to understand the actions of 'individual' students in terms of what a higher education means to them. It is the *individual* level of study that is more likely to yield more meaningful information on why students withdrawal, underachieve and fail university degree programmes.

A research project conducted by Leitch (1994) at the Glasgow Caledonian University attempted to analyse the causes of failure, focusing on two main areas of interest: (1) academic background at entry, and (2) factors affecting academic performance. The relationship between previous academic attainment and performance is unclear, but what does become apparent is that selection procedures cannot provide a solution to the problem of high non-completion. However, a more elaborate model of student failure and withdrawal is required. A more qualitative approach designed to identify patterns of response among weak and 'at risk' students may yield data which can be quantitatively tested (Leitch, 1994). Leitch (1994) reports on several attempts to identify 'at risk' students using atheoretical quantitative statistical methods which in the past have not been successful. Leitch implies that a theoretical qualitative framework is needed and that purely statistical approaches are unlikely to be successful. A theoretical qualitative analysis of student approaches to undertake particular tasks at deep or surface levels is required. Rigorous qualitative methodology illuminates the process of intellectual development in a way that properly reflects different perspectives and experience of learners. The notion that there is a particular set of skills that constitutes effective studying and thereby guarantees better learning outcomes is open to serious criticism.

2.3.4 Theoretical Models of Change

In educational research there are three main types of theoretical models: *System models*

(which are concerned with the source of behavioural change); *Stage models* (which are concerned with discrete stage events which are a result of a "crisis") and *Developmental models* (which describe the unfolding of change processes as they occur (Cryer & Elton, 1990).

In this research, a range of existing educational theoretical models will be considered and reviewed: Wright's *system* model on the factors which determine student non-completion (see Figure 1), Tinto's *system* model on student non-completion (see Figure 5), Perry's *stage/developmental* model on student intellectual development (see Figure 4) and the work by Cryer & Elton (1990) and Elton (1996) on catastrophe theory which links ideas about levels of student motivation and commitment and its relationship to student non-completion (see Figure 2).

2.3.5 Tinto's Model on Student Non-completion

With regards to earlier attempts to develop a theoretical model on student non-completion at university, Tinto (1975) produced a system model based on the observations made on how individuals integrate into society; or in the case of the university, how students integrate into the fabric of the university 'society'. Tinto assumes that students who fail to conform and integrate into the university are at risk of failing academically. Tinto relies heavily on 'cost-benefit' analysis theory, arguing that students are unlikely to be committed to a degree course if the benefits of being somewhere else outweigh the benefits, both present and future, of being at university (Mallette & Cabrera (1991). To illustrate this, Tinto (1974) compares suicide cases in everyday society to student failure in the university context and suggests that students who fail or experience academic difficulties while at university often have a low level of commitment to the university as well as to their studies. The relationship between low commitment and student withdrawal and underachievement (rebellion) is also noted in later works by Cryer & Elton (1990) and Elton (1996) in their work on catastrophe theory.

Tinto (1974) describes three models on drop-out in his attempts to model withdrawal and failure in Higher Education:

(1) Predictive Model

(2) Model of Drop-Out

(3) Longitudinal Model of Drop-Out

In these models, he attempts to cover the determinants of failure or success. Notably, student expectation, social status, educational experience prior to university, gender, age, academic ability, residence and commitment to the university and the course. In his conclusion, Tinto also noted that all can have direct or indirect impact on student performance at university.

Tinto's (1975) model of student non-completion is a conceptually useful framework for describing the dynamics of dropping-out. It provides a starting point for further researchers concerned with university policy making decisions. Tinto's study and conception of the model points out the complexity of the sociological and psychological dynamics of student non-completion and retention. However, student background and levels of academic and social integration only play a small part in the description and explanation of the dynamics of attrition and retention (Terenzini & Pascarella, 1980). Pascarella & Terenzini (1980) also studied the works by Spady (1970; 1971) and Tinto (1974; 1982) and agree with the argument that a current lack of understanding of the student non-completion process is due to the fact that research emphasis has been overly descriptive. In an attempt to provide a conceptual framework to research in student non-completion, Pascarella & Terenzini (1980) build upon the work by Spady by developing an explanatory and predictive model of the non-completion process, but also recognise that the resulting model is longitudinal and focused on the quality of the students' interaction with the academic and social environment of the university.

McKeown (1993) provides a critique of Tinto's theoretical model, arguing for a new approach which understands the actions of the student from their point of view. In order to implement such a study, a research approach based on qualitative research methodology is proposed as a way forward. Henwood & Pidgeon (1995) recognise a need in the human sciences to be sensitive to the individuals' own understanding of their world as seen from their frame of reference. Henwood & Pidgeon (1995) support

the employment of qualitative research methods to fulfil these aims and suggest psychologists and educationalists can benefit from conducting qualitative research to generate good grounded analysis and theory from the participants' own experiences.

2.3.6 Intervention Programmes

Previous attempts at diagnosing individual student problems include important work by Parsons & Meyer (1990) and Meyer & Parsons (1994). Parsons & Meyer (1990) identified students academically 'at risk' and then involved them in an intervention programme aimed at changing their perception of studying and learning in Higher Education. Parsons & Meyer (1990) noted three points of interest: teacher/student relationships; the student perception of textbooks and note-taking, reading and the use of library facilities and the nature of knowledge about assessment and examinations. Alternatively, Oldham (1988) and Parsons & Meyer (1990) indicate in their research that failure in Higher Education is not simply attributable to a lack of intellectual capability or insufficient effort on the part of the student, but relates to an inadequate handling of the critical interface between the student and the institution. In most institutions in Higher Education, the *rite de passage* from school to university is ignored by the institutions involved. In particular we fail those students who have difficulty in adjusting to the type of work expected from them in Higher Education.

2.4 Psychometric and diagnostic testing

2.4.1 Research on Intellectual Development

Egan (1983) remarked on the concept of educational development as seen by Plato...

> ..."Plato sees the process of educational development as beginning in a world of sensations and the manipulation of concrete objects and leading by degrees to sophisticated abstract thinking." (p.33, Egan, 1983).

In more recent times, the general area of intellectual/educational development has traditionally been in the domain of psychology, with a focus on the growing child (Piaget, Bruner, Kohlberg and Vygotsky being the most popularly mentioned theorists). Piaget saw intellectual development in children as a continuing process of discovery which he divided into four main stages: sensorimotor (0-2 years), pre-

operational (2-7 years), concrete operational (7-11 years) and formal operational (12 years and above) (Ginsburg & Opper, 1979).

Piaget states that two processes - assimilation and accommodation are essential for growth. The child assimilates new information into an existing view of the world, thereby filling in more detail. If it does not fit into past experience the child accommodates the new information by revising a way of thinking and changing schema - the hypothetical building blocks of thought based on the symbolic representation of experience. The increasing use of information and its accommodation into a new way of thinking indicates intellectual growth and development.

Piaget's theory is the notion that what propels the child from stage to stage is 'disequilibrium'. A prominent feature of childhood is the marked self centred way of thinking typical of children. In the early stages of development children assume that others see the world in exactly the same way as they do. However, children are generally made to realise that they are not necessarily correct in this view.

Piaget's view of intellectual development was described in a number of stages and through his research, Piaget became aware that there were striking differences between the child and adult thought processes. Piaget became convinced that it was necessary to see intellectual development in terms of evolution through differing stages of thought. Piaget also attempted to discover the causes of intellectual development in children. His first attempt concluded that intellectual development resulted from the interaction of social factors (like language and contact with parents and peers) Ginsberg & Opper (1979). Piaget also pointed out that a lack of environmental stimulation can also result in a slowing down or complete cessation of intellectual development. Piaget's work, however, concentrates on the developing child and relatively few authors and researchers have taken an interest in intellectual development later on in life. For Piaget, the adult intellect emerges at the formal stage of operation, roughly at eleven or twelve years of age which is somewhat surprising when many people feel that they reach the peak of their intellectual functioning whilst at college.

Piaget's definition of intelligence stems from biological terms: growth, stage of development, adaptation and equilibrium. Intellectual adaptation is also an interaction between the individual and the environment, and adaption consists of two processes: assimilation and accommodation. In his work, Piaget describes two stages of development which are of relevance to the study of intellectual development in students and adults. Piaget identified a concrete-operational stage and a formal-operational stage. Formal functioning begins around the age of twelve and develops throughout adolescence, but the rate of development can vary between individuals and cultures. A concrete-operational individual does not consider possibilities on a theoretical plane, but works with what is there, what is real or concrete. The formal-operational individual, imagines what might occur, what interpretations may be possible, and in essence, deals with propositions. The formal-operational individual is therefore theoretico-deductive and performs a hypothetical analysis to obtain empirical data which either confirms or refutes his/her ideas. A formal-operational individual has achieved an advanced state of equilibrium and the individual's cognitive structure has now matured to the point where he or she can effectively adapt to a variety of problems (Ginsburg & Opper, 1979).

However, Post-Piaget researchers (Sutherland, 1980) showed that secondary school pupils, on average, reach concrete operational stages in the first year of secondary school. More importantly, only a half of these pupils reach the formal operational stage by sixteen. It therefore cannot be assumed that all post-16 year olds are capable of formal operations. It may also be true that students post-18 may never reach the formal operational stage while at university. To address this, the tutor in Higher Education must provide a relevant practical experience as an introduction to academic study for the students before trying to lead them on towards a more abstract approach.

The only real attempt at describing intellectual development in adults, and more importantly, in young adults, can be found in the work on intellectual development in students by Roy Heath and William Perry.

Roy Heath (1964; 1978) carried out interviews at Princeton University. Heath studied 36 male students who began their studies in 1954. He interviewed them every week

throughout their time at college and built up a profile of each individual and identified each stage of intellectual development. Heath identified four distinct student types:

'non-committers'	- general tendency to avoid any involvement;
'hustlers'	- possesses a drive to achieve tangible rewards and thrives on purposeful activity;
'plungers'	- tendency for deep involvement;
and 'reasonable adventurers'	- success related to a combination of two traits: a flair for change and a sense of world relativeness.

Heath (1968) was largely interested in personality and temperament factors which determine success or failure in a student. The first three types approached their studies in contrasting ways which was also reflected in their personalities. However, all students eventually progressed towards one single intellectual goal or type - that of a 'reasonable adventurer'. The students within each category matured during their four years at Princeton , but several achieved an apex in development. Their individuality a finely delineated; they a less self-centred and more compassionate. The students who reached this stage in personal maturity, alternating detachment with involvement were call the 'Reasonable Adventurers' (Heath, 1964). A Reasonable Adventurer is well-balanced and an ideal candidate.

Heath described a single dimension of intellectual development common to all 36 students, but noted that each student experienced differences in the paths they took to reach that goal. The starting-point varied between the student sample, but the end result was basically the same (Entwistle, 1988). Heath relied entirely on intuition when describing his interview data and of the thirty-six students he interviewed, six dropped out and two died leaving twenty-eight to complete the degree programme. In the Freshman year, twenty-one were in the lowest developmental category (non-committed). By the Sophomore year this total dropped to eight. In the junior year five students were left in this category and in the final year no students remained in this category. In the highest category (reasonable adventurer) the total number of students in this category jumped to sixteen (Entwistle, 1988). Heath also related this to

academic performance. Heath suggests that there is a high correlation between academic performance and the level and type of development. Of the thirteen students graduating with honours, twelve were in the top of Heath's model (reasonable adventurers) - the ideal student type.

When reflecting upon Heath's model, it is evident that this is a *non-staged* model of student development which differs from the next model devised by William Perry which is clearly a *developmental* model of student intellectual growth (Richardson, 1983).

The second American study provides a more detailed analysis of student intellectual development. William Perry (1970) used a similar research methodology (open semi-structured interviews) to Heath (1964; 1978) to describe the intellectual development of his sample of students. Perry's model is a full range scheme which begins with a simplistic form where the person sees the world (and especially their studies) in polar terms starting at one extreme where knowledge is absolutely right or wrong and the other extreme where knowledge involves a complex process or thought (Perry, 1970).

In the 1950's and 1960's, Perry - a Student Counsellor at Harvard University became interested in how undergraduate students develop in terms of intellectual functioning. Perry was struck by the qualitative change in the students' *thinking* as they progressed from first to final year at university - a change which begins with simplistic thought and develops into an in-depth, contextual and relativistic reasoning. From research undertaken as a result of his interest, Perry embarked upon a longitudinal study of student intellectual and ethical development which relied on information obtained from interviewing students studying at Harvard and Radcliffe Universities in the United States. In his study, Perry interviewed sixty-seven students once each year for four years. After collecting and collating the written transcripts of interviews conducted during his research, Perry discovered from reading and re-reading interview transcripts, that he could successfully develop a comprehensive model of undergraduate intellectual development for students in Higher Education.

In his model, Perry describes a "journey" that students take through their chosen discipline or area of specialism. The starting point is dualistic thinking and the destination is relativistic reasoning. Series of stages or "positions" are identified whereby nine positions are grouped into four main categories:

- Dualism,
- Multiplicity,
- Relativism,
- and Commitment in Relativism.

The first five positions are largely concerned with intellectual development and the last four positions focus on the student's ethical development and the development of an individual identity. Each stage or "position" represents a unique way of thinking - a way which students understand, interpret and appreciate their world at that particular moment in a programme of studies. For example: a DUALISTIC student expects to be told the "right" answer and in general has a surface or reproducing studying approach. This is characterised by copying out of texts and rote learning. Any difficulty in understanding a part of the course would automatically be attributed to 'bad teaching' or 'boring books'. A MULTIPLISTIC student acknowledges the simultaneous existence and use of two or more theories and answers, but will choose and present the theory or answer he or she believes the lecturer perceives as being the "right' answer. Underlying this category of learning is a high dependency on the lecturer, who is trusted as the only guide through a large and complicated subject. There is also the assumption that lecturers are incapable of awarding credit for "opposing' interpretations or opinions. RELATIVISTIC students argue that it is acceptable for competing theories to exist. The challenge is which one to use and how to re-evaluate it in terms of strengths and weaknesses which are recognised by the learner rather than the lecturer. Finally, a COMMITTED student is a fully independent, questioning, deep thinking learner. As a result, the student is ready to make an initial commitment to one side of the argument, but at the same time, experiences the implications of that commitment and explores the problems of this responsibility in terms of what evidence is available to support this commitment. This kind of learner will not only pursue an argument in

favour of a particular theory or position, but also be capable of synthesising parts of other arguments and theories through a process of rhetorical debate. Ultimately, this student is capable of *changing* his or her own mind rather than *having* it changed for them.

This is summarised below:

(1) Basic Dualism

Position 1 - the student sees the world in polar terms - right or wrong, black or white.

(2) Multiplicity - Perception of diversity

Position 2 - the student realises that the world is less simplistic than formerly thought. The student perceives diversity of opinion and recognises uncertainty, and accounts for this by believing that the lecturing is poor or that the exercise is designed in such a way that the student has to learn how to find a single answer. Should that solution prove elusive or "wrong" - at this point, the student may feel insecure with his or her own learning ability, and at that point may choose to 'retreat' or withdraw from learning.

Multiplicity - Acceptance of diversity and perception of uncertainty:

Position 3 - the student accepts diversity of opinion and uncertainty, and accounts for this by assuming that the lecturer has not found the answer yet, although this is only a temporary state of affairs. The student supposes that the lecturer assesses the work on merit, but is confused as to what the required standard of the work is. Again the student is unsure of the situation and may choose to 'retreat' from studying or otherwise adopts a learning approach which covers those problems at a later stage in Higher Education. The most frequent example is memorising information in the hope that it will eventually make sense.

Multiplicity - Perception of uncertainty and diversity:

Position 4 - the student perceives uncertainty and a consequent diversity of opinion and accepts that 'everyone has a right to his or her own opinion'. However, the student sets this against the lecturer where right and wrong still prevails in a sense. The student discovers qualitative reasoning in the case of 'what the lecturer wants'. At this stage,

there is a vulnerability to feelings of wanting to 'retreat'. This may be done at the most obvious level through extra-mural activity, but less obvious is the possibility of academic escape through total immersion in an area of study that is especially appealing or just "easy".

(3) Relativism - Accepting knowledge as contextual and relative

Position 5 - the student recognises that knowledge is contextual and relative. Dualistic thinking can be appropriate, but only in certain contexts. Especially important is an evaluation of the validity and reliability of evidence in relation to methods used in collection and analysis.

(4) Commitment - to make sense of diverging opinion

Position 6 - the student realises that some form of personal commitment is necessary to establish an identity and to make sense of this diverging chaos in information and opinion.

Commitment - making decisions and providing evidence:

Position 7 - the student makes an initial commitment in some area. In this way there is an application of what is being leaked to the students' personal life, background experience and/or interests.

Position 8 - the student experiences the implications of commitment and explores the problems of this responsibility and accurately weighing up the associated advantages and disadvantages.

Position 9 - the student experiences the affirmation of identity among multiple alternatives and realises that commitment is an ongoing and unfolding activity.

To illustrate this in a more user-friendly manner, Wilson (1980) has produced "A developmental model of student learning", which helps to explain the work by Perry in (Figure 3).

Figure 3

A developmental model of student learning

Presage factors (eg. previous academic attainments, educational and socio-cultural experiences) determine the point of entry along the path from dualism, uncertainty, relativism to commitment and also influence the rate of progress in intellectual development the student experiences.

Learning dependency	Field dependent, low ability, dependent learner, reproducing	Field independent, high ability, independent learner, internal
general path commitment	dualism ---------- uncertainty ---------- relativism ----------	
	low confidence ---------- high confidence	
academic achievement	Tendency to lower achievement	Tendency to higher achievement
assumptions about knowledge	Knowledge is right or wrong	Knowledge derives meaning in a certain context
Student role	'Answers' exist to be reproduced for staff	'Answers' are dependent on context
Approach to the learning task	Surface, unreflecting, syllabus bound, cue deaf, conscientious, but unimaginative and without ideas	Deep, thoughtful, questioning, syllabus free, cue seeking, bright, smart and with limited ideas

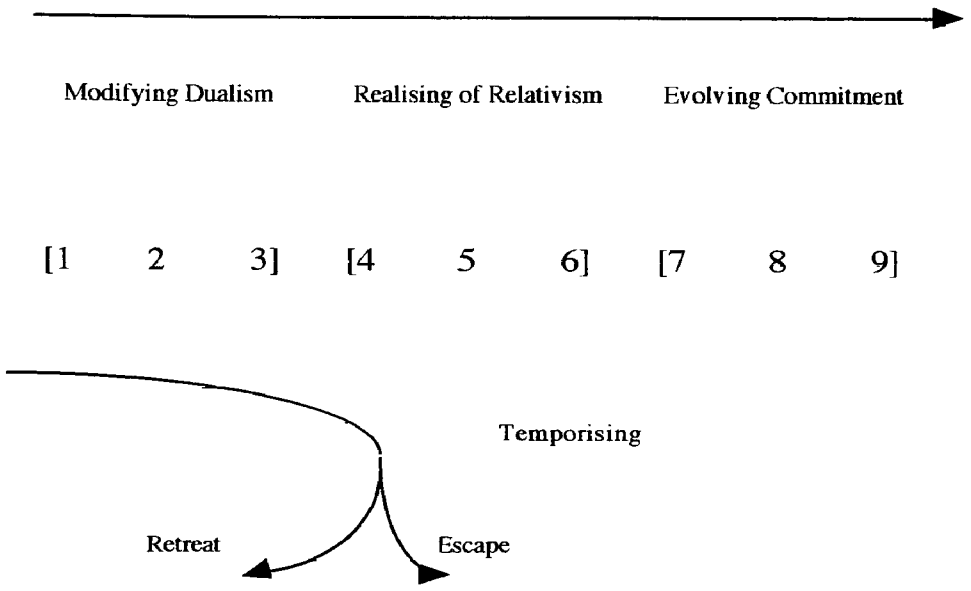
Source: Wilson (1980) In: "Higher Education at the Cross-Roads" Oxtoby, R (eds) SRHE

According to Perry, failure by the student to move on from being totally dualistic to being multiplistic, may result in (extreme cases) an interruption in the student's academic progression identifying periods of delay, deflection and regression or (as described by Perry) periods of: TEMPORISING (prolonged pause in one Position resulting in very little actual intrinsic development signifying a drop in motivation), RETREATING (rejection of next Position or stage of intellectual development) or ESCAPING (rejection of any further intellectual growth and an abandonment of the degree programme) stages or more commonly withdrawal or academic failure (see Figure 4).

Figure 4

A Schematic Representation - Perry (1970)

(The different ways in which a student responds to the relativism which permeates the intellectual and social atmosphere of a university.)



Students grasp the notion of a multiple frame of reference at some point in their academic career, which will vary between students and between disciplines (Perry, 1970). The important question to ask is "How do students who experience the pluralistic environment of the university assimilate the 'experience', and what is the difference between a student who does and one who does not?"

The recognition of reality and uncertainty of knowledge, while intellectually challenging to the student, can provoke an emotional crisis. Emotional panic may overwhelm students as they realise that there are no absolute answers to anything - both in their academic studies and in life in general. At this point, Perry identifies characteristic interruptions in intellectual development - "escape", "temporising" and "retreat". It is also important to note that this panic is an emotional reaction to the student's academic life and not a personal emotional crisis.

The students who resolve this problem, and do not 'backslide' or leave their course,

do so by recognising that the lecturer demands relativistic reasoning and that it is a necessary part of the university's attempt to develop the student's intellect - to make them think critically. Perry therefore suggests that this emotional conflict is perhaps created by the rapid growth in complexity of the curricula or a sudden change in the academic demands placed on the student (Entwistle, 1988). To deal with this problem the students have to 'learn' fast and develop ways of working and thinking which are new and foreign to them, and it is this change or crisis which could determine how students perform in their course work and examinations at certain stages of their academic career.

Heath and Perry suggest important dimensions of intellectual development which reflect the idea of the development of critical thinking, described traditionally as the main aim of higher education (Entwistle, 1988). More importantly, the work by Perry is useful to this study because it identified the emotional conflicts created by change as the student recognised how uncertain knowledge and their own learning is. The point of this personal conflict and crisis, however, can occur at any time, but clearly certain times are more prone to change than others during the course of a degree programme. Heath argues that the 'ideal' student is the "reasonable adventurer" and it could be argued that if students enter university at this stage of development, they are more likely not to experience difficulties with their studies. Alternatively, a student who is low on the scale i.e. a "dualist" (Perry) or a "non-committed" (Heath) student, may experience greater problems of progression through the course.

Critical analysis of Perry's Model

Perry's scheme, however, has several critics. Perry relies heavily on the validity of the findings. The most significant limitation in Perry's work is the absence of an indication of how everyday approaches to studying affect the students' understanding and subsequent intellectual development (Entwistle, 1988).

However, unlike many other theorists, Perry seeks to identify the stages of potential withdrawal and failure and attempts to explain *why* a student experiences some difficulty with studying and *when*, theoretically, this may occur. Perry identifies the

boundary between the dualistic and multiplistic stages as being the critical point which determines whether or not a student retreats from learning; and the boundary between the multiplistic and relativistic stages as the critical point which determines a temporising or escaping behaviour. The actual start and end points for each of the four categories and nine stages or position of development are ill-defined - for example, does dualism start at university or with A' Levels, or earlier? When does a student move from a dualistic approach to a multiplistic one and where does a student become 'at risk'?

Perry's work largely focuses on one discipline area within the Humanities - the Liberal Arts, and addresses students who largely would have a good idea of what he may be trying to achieve through his research. Indeed, virtually all of the research on Higher Education has focused on the Humanities and Social Sciences. This is because it is particularly convenient for the researcher given the nature of the subjects requiring students to reflect and self-analyse and to articulate their feelings and thoughts more extensively. For this reason, this research investigates a technological discipline, far removed from that of the humanities. The study therefore involves a student sample which is unlikely to contain individuals who may have knowledge of educational psychology which could contribute some bias to the results obtained.

Perry's model focuses on students in the United States during the late 1950s and early 1960s and therefore even in its simplest form, it may not be typical for all student intellectual development today in the 1990s. It is questionable whether this work by Perry reflects the whole student population given the various differences between the disciplines, their methods of teaching and learning, and the different overall educational and professional aims of degree programmes. Perry's scheme is also particularly limited in that it focuses on one common scheme of intellectual development, reducing the minimum consideration of individual student differences based on: personality, temperament, ability, previous learning experiences and personal factors.

Perry admits that he did not attempt to systematically trace individual intellectual development paths - unlike Roy Heath (1964), which might have assisted him in

identifying and providing a characteristic definition of student typologies, and more importantly, the type of student that may be 'at risk' of not completing the degree programme. Perry's sample was also composed of students who volunteered to be interviewed, and selected on the basis of completed questionnaires which were based on a check list of educational views.

There is an issue of gender bias in the original Perry Scheme. Perry's study is based on the study of largely male students, and as a consequence assumes that intellectual development is the same for both men and women. Perry identifies critical points of withdrawal and failure, but he does not elaborate on them and the researcher is left with the feeling that they are just 'afterthoughts' and a fleeting attempt to explain the process behind student underachievement, withdrawal and failure. The points of exit as identified by Perry: TEMPORISING, RETREATING or ESCAPING are obvious *coping strategies* adopted by the student when faced with studying difficulties and the eventual realities of underachievement and failure. However, Perry does not elaborate on these points and no real account of the process behind underachievement and failure is made. It is important to note here that there is a distinction between the student *approach* to learning and the actual *thinking* process. For example, students can be very diligent in their studies, but if they do not respond to efforts by academic staff to 'push' them on towards 'growth' they may fall behind, and in the extreme - underachieve, withdraw or fail their degree programme.

In terms of validity and reliability, Perry assembled a group of six judges - graduate students in English to study and evaluate the interview transcripts he had generated. The judges were given unedited transcripts of the interviews taken from the years 1958, 1962 and 1963. The judges worked independently of each other, and analysed each interview document by matching them with the positions drawn on the *Developmental Chart* (see Figure 5).

Finally, the main criticism of Perry's model or scheme is the complexity of the language it uses to describe each position and each stage of development. To the academic who is not a psychologist, this type of terminology may be somewhat

difficult to grasp and fully interpret. Perry's model is also unrealistically idealistic; for example, many students may be at the 'committed' stage, but if they perceive that a dualistic strategy will get more marks from an individual lecturer, they will perform accordingly.

Intellectual development and grade performance

The work by Tinto recognises a relationship between intellectual development and grade performance (Figure 5). However, the level of academic success at university is traditionally measured in terms of an individual's academic performance, and academic grades are seen as the most visible form of academic reward. In this respect, they represent an extrinsic reward for the student's participation in the academic system and one which is very tangible. Intellectual development represents, on the other hand, a more intrinsic form of reward viewed as part of the student's personal and intellectual development. Intellectual development is also a measure of an individual's evaluation and appreciation of the academic system, grade performance reflects an evaluation of the student's achievements to date by the university. The grade performance, however, is a reflection of the student's ability coupled with the university's preference for a certain learning style and may not be a true reflection of their level of academic achievement or of their level of intellectual development. It is important to note here that pure intellectual development is not, in itself, actually rewarded in Higher Education. A 'good' student , it is argued, is more likely to appreciate and value their education as a process of gaining knowledge (e.g. as a process of intellectual development) rather than as a vehicle for purely gaining academic credit or good grades which can later be of a vocational value. The study of intellectual development is therefore important as it is an integral part of a student's personal development at university, and a distinction needs to be made between the changing nature of intellectual development and its relationship to the level of academic achievement.

The critical points of withdrawal or failure

Perry's Model or Scheme of intellectual and ethical development neatly considers the issue of student withdrawal and failure and he attempts to identify the key or critical points at which a student is more likely to be 'at risk' of withdrawing or failing the

degree programme. In his model, Perry described withdrawal and failure in terms of 'temporising', 'escaping' or 'retreating' from the normal path of the scheme, all of which represent a delay or temporary period of 'backsliding' within the student's academic progress. These points can be identified as the critical points at which a student withdraws from a course or where the university decides to fail a student. However, even though Perry attempts to identify, theoretically, *why* a student experiences difficulty, he does not indicate exactly *when* the problem begins to occur. From Perry's model it is suggested that a student is more likely to experience difficulty during the 'multiplistic' and 'relativistic' stages of intellectual development, but it is uncertain when this stage should occur with the degree programme as Perry's model does not accurately define the actual start and end points for the nine stages or positions - for example, does dualism start at university, or with A' Levels, or earlier? Another problem with Perry's model is that he assumes there is a simplistic generic intellectual progression from level one-to-two-to-three and neglects to recognise the possibilities of reverse movement so that relativistic awareness moves back to dualistic reasoning on some occasions. Perry's model on intellectual development attempts to categorise students in terms of a particular stage of intellectual development, making allowances for a gradual intellectual development and an explanation of the overall learning progress. Perry outlines a process of intellectual development which leads the student through a series of potential self-doubt which can interrupt this development. More importantly Perry suggests that intellectual development is difficult and not always guaranteed to be successful (Parker, 1978).

Creme (1997) reflected on Perry's *Scheme of intellectual and ethical development* in relation to a study conducted into the experience of two mature students studying at the University of North London on a modular degree programme. Creme (1997) questioned how far Perry's scheme could be applied to the mature students' experience of Higher education and the implications this experience has for course development. Perry notes that there may be a tendency, in some cases, to regress to an earlier position in response to a new and intimidating academic situation. Perry (1988) notes that intellectual and therefore academic growth is not linear, but reconstructive. If academic growth is not purely linear, this may support the argument which states it is unsafe to

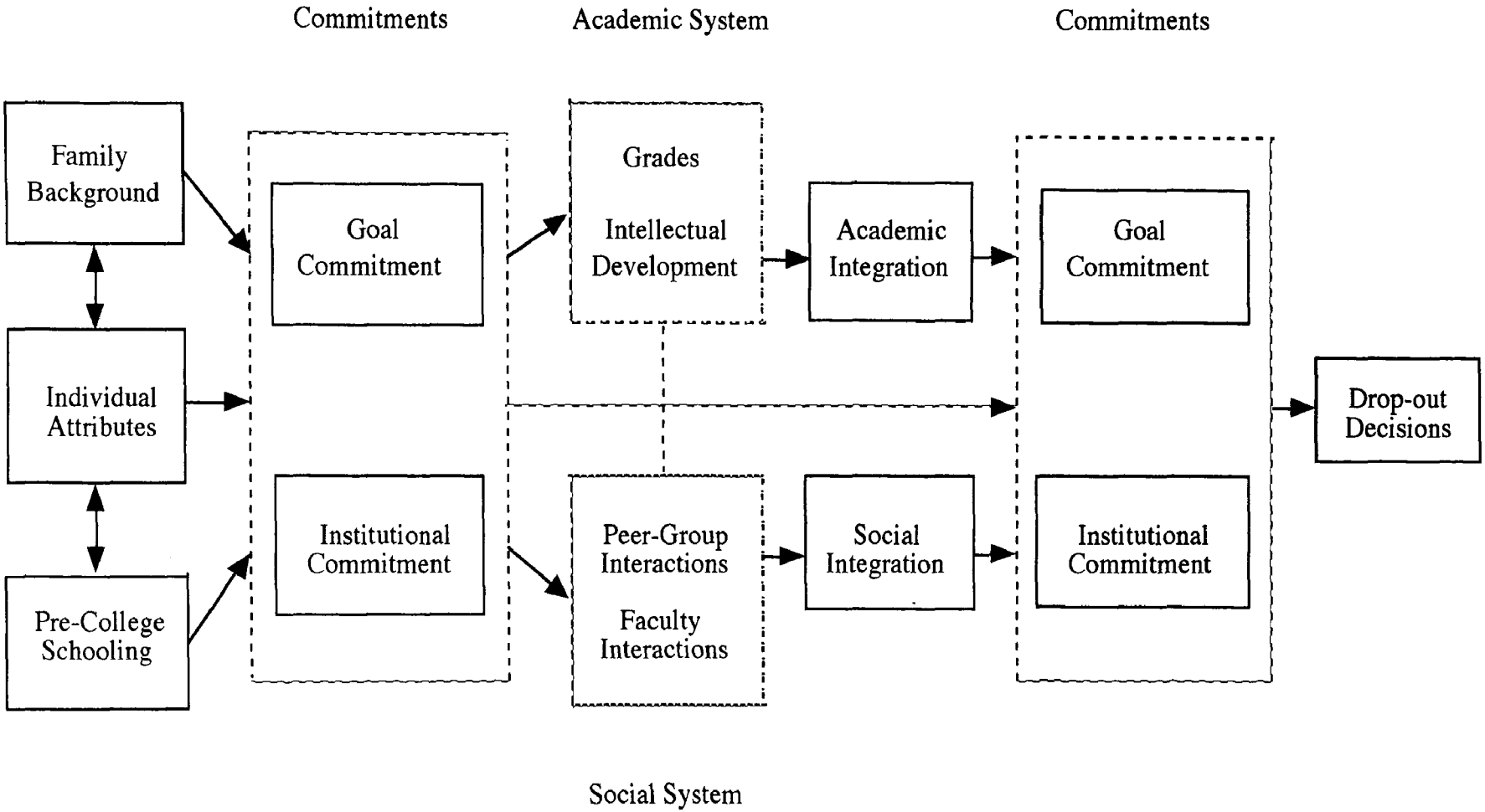
use entry qualifications as a predictor of future academic performance. If academic growth is reconstructive, this may support the argument which suggests that it is the negative and positive critical points which are important in initiating either an improving or declining performance.

2.4.2 Categories of student learning - Approaches to Studying Inventory

Identifying the characteristics of successful students - Between 1968 and 1981, a research programme at the University of Lancaster sought to identify the factors associated with academic success or failure at university. This study explored the various factors that could contribute to success or failure and these identified factors which included: school attainment, verbal and mathematical aptitude, personality, motivation, work habits and study methods and early university examination grades (Entwistle, 1987). The original aim of this research failed to produce the desired results and the research followed a different aim from the late 1970's. As a result, 'The Approaches to Studying Inventory or Questionnaire' was developed from a number of research findings made in the late 1970's by Entwistle, Wilson and Ramsden at the University of Lancaster. In particular the intention of this new inventory was to measure and investigate the relationships between the concepts identified by Marton & Saljo (1976), Svensson (1977), Miller & Parlett (1974) and Pask (1976) and to identify and predict subsequent academic performance at university. Marton & Saljo (1976) identified two different approaches to learning: *surface-level processing* where the student adopts a rote-learning or reproductive strategy and *deep-level processing* where the student is directed towards comprehending what is to be learnt. Lennart Svensson (1977) also arrived at a similar distinction and described the student's approach to learning, but uses a different terminology to explain the different ways students organise themselves: *atomistic* (surface processing) where the student focuses and memorises parts of what is to be learnt in sequence and the *holistic*. (deep processing) approach where students attempt to understand the message as a whole and identify the author's argument and supporting facts. In addition, Miller & Parlett (1974) looked specifically at students' perceptions and attitudes to studying and learning. Finally, Pask (1976) suggested two categories of learning which could be

Figure 5

A conceptual Schema for Drop-out from College (Tinto, 1982)



identified: (a) *serialists or operation learners* who learn and remember a body of information in terms of a 'string-like' relationship and (b) *holists or comprehension learners* who learn and remember the material as a whole. Pask also suggested there are students who can act either way, depending upon what is to be learnt and what the likely assessment will be.

Entwistle & Ramsden, further developed their work on: *surface* (reproducing orientation) and *deep* (meaning orientation) approaches by adding a third *strategic approach* (achievement orientation). The idea of a *strategic approach* can be traced back to the work done by Miller & Parlett (1974) on student perceptions in learning and assessment. Entwistle & Ramsden further introduced notions of style and strategy for learning, stemming from the work done by Pask (1976), where student learning is characterised by two main strategies: *improvidence* (an explanation of the facts, but without a structure) and *globe trotting* (a personal conclusion without supporting evidence). The research at Lancaster concluded in the development of a series of inventories designed to study student motivation and studying methods. Originally, the inventory was developed for the specific purpose of predicting future academic performance, but a later inventory was developed as an attempt to advance the understanding of the range of student approaches to learning.

The Approaches to Studying Inventory

The final Approaches to Studying Inventory (ASI) was developed in 1983. This is probably the most widely used questionnaire on student learning in Higher Education. The Approaches to Studying Inventory incorporates a variety of constraints taken from previous research works done on the subject of student learning, and its final version consists of sixty-four items divided into sixteen sub-scales, grouped into four general headings: a 'deep', 'surface' and 'strategic' approach , subsumed into the broader classifications of 'meaning orientation', 'reproducing orientation' and 'achieving orientation', supplemented by a fourth classification representing the various learning styles and strategies as described by Pask (1976). Table II provides an outline of the inventory, accompanied by a brief description of each sub scale.

Table II. Entwistle & Ramsden's original Approaches to Studying Inventory (ASI)

Subscale:	Meaning:
Meaning orientation	
Deep approach	Active questioning in learning
Inter-related ideas	Relating ideas to other parts of the course
Use of evidence	Relating evidence to conclusions
Intrinsic motivation	Interest in learning for learning's sake
Achieving orientation	
Strategic approach	Awareness of implications of demands made by staff
Disorganised study methods	Unable to work regularly and effectively
Negative attitudes to studying	Lack of interest and application
Achievement motivation	Competitive and confident
Reproducing orientation	
Surface approach	Preoccupation with memorisation
Syllabus-boundness	Relying on staff to define learning tasks
Fear of failure	Anxiety about learning outcomes
Extrinsic motivation	Interest in the degree for the qualification it offers
Styles and strategies	
Comprehension learning	Readiness to map out subject and to think divergently
Globe trotting	Over-readiness to jump to conclusions
Operation learning	Emphasis on facts and logical analysis
Improvidence	Over-cautious reliance on detail

Source: Ramsden & Entwistle (1981) ; (1983)

Criticisms

- The original A.S.I. has been criticised by some researchers for being too ambiguous. The fourth section in the Inventory or Questionnaire deals specifically with the student's *style of learning* , whereas the remaining sections deal with the student's *approach to learning.*

- The ASI can only measure a student's approach to studying and learning at one moment in time. It is quite common for students to change their approach to

learning in accordance with the demands of each given task or subject area.

- Questionnaire methodology can only infer inner attitudes and dispositions, and is always susceptible to people replying in ways that they think are either socially acceptable or expected of them.

- The ASI attempts to measure students' 'actual' orientation, encouraged perhaps by their lecturers and discipline areas, rather than their 'preferred' orientation in an ideal world.

2.4.3 Learning Styles

Honey and Mumford's (1986; 1995) learning style research has been developed from that of Kolb (1975; 1984). Honey and Mumford (1986; 1995) designed a modified learning styles questionnaire (LSQ) to help identify preferred styles of learning. The LSQ focuses on behaviours of the individual, i.e. what students do, translating them into preferred styles of learning. It is a self-perception inventory, designed to give general trends in behaviour rather than a detailed analysis of an individual. Four distinct styles were used: activist, reflector, theorist and pragmatist. These were directly linked to the four stages in the learning cycle as described by Kolb (1975; 1984).

Ahmed et al (1997) also refers to the work of Kolb (1984) and Riding (1996) and notes two main cognitive styles. Kolb established four learning styles (convergers, divergers, assimilators and accommodators) and concluded that civil engineers are predominately 'convergers'. The alternative approach by Riding (1996) illustrates two basic cognitive styles: the holist-analytic (the student who takes a whole view approach or sees things in parts) and the verbal-imagery (the student who is more verbal and thinks in terms of mental pictures or images). Ahmed et al (1997) also pointed out that the converger element in Kolb's learning styles matches with Riding's description of analytic-imagery. In a similar manner, holist-verbalisers compare to Kolb's 'divergers'. Kolb notes that convergers are usually outgoing, reflective, independent, deep in their approach to learning and able to form abstract concepts. In contrast,

divergers exhibit the opposite characteristics.

2.5 A new focus for this research: Crises Identification

2.5.1 The Stage Model and Crisis Theory

Erik Erikson described eight life stages, each of which includes a new challenge or "crisis" that must be negotiated successfully before an individual can cope adequately with the next stage. Stage models, such as Erikson's, are often depicted as spiral staircases; failure to attain one landing implies a failure to attain the next. However, it is debated here that development (educational, intellectual and social) can only occur at staged events and as a result of a "crisis". *Crisis theory* deals with the impact of external disruptions on established patterns of personal and social identity. Individuals constantly have a need for a social and psychological equilibrium. When students encounter an event (social or academic) that upsets or alters their characteristic patterns of thought, ideas and behaviourism they employed alternative problem-solving strategies to solve the problem until a balance is restored. *Crisis theory* is based on the harmful rather than the positive influence of life events. Life transitions (the transition from school to university) and everyday crises often provide the essential conditions for psychological development. Stressful or unwelcome episodes can enrich a person's beliefs and values by making it necessary to assimilate new experience with old. This process itself promotes cognitive integration and stimulates personal growth that strives to cope with the new situation.

In order to adapt to a changing social and academic environment. The student can be driven to adopt appropriate or inappropriate ways of coping with this change. In psychology, "coping skills" are used individually, consecutively or more likely in various combinations. *Positive Coping* skills can be organised into three domains:

- *appraisal-focused* - attempts to understand and find a pattern of meaning in a crisis (intellectual problem solving);
- *problem-focused* - seeks to confront the reality of a crisis by dealing with the tangible consequences of that crisis (practical problem solving);

- *emotional-focused* - manages the feelings provoked by a crisis and to maintain equilibrium (emotional problem solving).

It may also be of interest, but Sutherland (1980) identifies negative and positive points in personal and possibly intellectual development. For example, a *negative crisis* in adults may be divorce or redundancy where a *positive crisis* may be becoming a parent for the first time or a job promotion.

It may be argued at this point that students may need additional support in selecting the right positive strategy to cope with this new crisis. Traditionally, the Personal Tutor system provided this type of support, but it is now feared that this is gradually being eroded as student numbers increase and tutors become overloaded in their role.

Tinto (1988) refers to the work of Arnold Van Gennep who was concerned with the movement of individuals through time. On the one level he was interested in the "life crises" that people face during the course of a lifetime. Tinto (1988) refers to the stages or rite of passage in the college/university student's career. Which provides a way of thinking about the longitudinal processes of student persistence and withdrawal. The first stage the student progresses through in a college/university career is one of SEPARATION. This stage requires students to disassociate themselves from a past life and past situations. This stage happens, physically more or less over night, but mentally there is a delay and the length of the delay depends on the individual. Generally, most students see the process of separation as the least stressful. A minority, however, see this separation as being so stressful that the only thing to do is to withdraw.

The second stage of the college/university student's career is the TRANSITION. Once separated from the past, new students have yet to acquire the patterns of a new behaviour which is appropriate to successful INTEGRATION. As a consequence, many withdrawals happen very early in the academic year. Immediate withdrawal occurs more from an inability to become integrated with the new social and academic community, rather than an inability to complete the first year. Tinto (1988) saw social

interaction within the school or faculty of study as being very important primary vehicles through which integration arises. Failure to do so leads to the absence of integration, both social and academic, and as a result leads to a sense of isolation. However, Tinto saw these stages (separation, transition and integration) as being over-simplified and the longitudinal process of departure is, in fact, a very complex and dynamic situation.

2.5.2 The search for a longitudinal model

Many previous studies on student withdrawal and failure in Higher Education have taken a limited time perspective, considering only two points in time: the point of entry and the time when drop-out actually occurs. However, it is reasonable to believe that what determines withdrawal in the early stages of an academic career can be quite different from those reasons which influence withdrawal later (Tinto, 1982). The Tinto models (1975; 1982) outline the longitudinal process by which a number of interactions force individuals to withdraw or fail their course, seeking to highlight the complex manner by which integration within the formal and informal academic and social system of the university influences withdrawal and failure. They also argue that much of the lack of understanding of the withdrawal process is due to that fact that previous research emphasis has been descriptive rather than theory-based (Tinto, 1982). However, Tinto's theoretical model is a starting point for this new direction of research. Tinto's model argues that the process of withdrawal and failure can be described as a longitudinal process of interactions between the academic and social systems in operation in Higher Education. Individual students enter university with a number of personal attributes, pre-Higher Education academic experiences and attainments, each of which directly or indirectly impact upon his or her academic performance at university. More importantly, background characteristics influence intellectual and educational development patterns and progress and the level of commitment students initially bring to their studies in Higher Education.

Interactions within the institutional environment - academic integration

The model argues that it is the individual's integration into the academic and social systems of the university that directly relate to the student's persistence or failure. In the

academic domain, if the student re-evaluates his or her educational expectations at any point during the course, and decides to voluntarily withdraw, this can occur despite successful integration by the student into the university. Alternatively, a student may choose to remain at university even though he or she has little or no commitment to completing the course. This phenomenon is known as 'getting by' or more commonly 'underachieving'.

Interactions within the institutional environment - social integration

Tinto (1982) provides evidence to suggest that a students' decision to withdraw from a course is significantly affected by the degree of intellectual and social integration into the institution and associated intellectual and social development. The factors which influence forms of integration, informal integration with other students and with the teaching faculty outside the formal teaching setting seems to be particularly important in determining student success. In essence, the more time a teaching faculty gives to its students, the more likely their students will successfully complete the course. Academically and socially, informal contacts appear to be essential in the process of social and intellectual development of individuals and therefore enhance student academic performance - maximising the student's natural potential in Higher Education.

2.5.3 The period of transition from school to university: the crisis of induction

A major determinant of student withdrawal or failure at university may be attributed to how successful the student is at making the transition from school or work to university life. Students who experience academic problems at university, especially at Level One, often fail to grasp the difference between the teaching and learning methods and learning requirements at school and at university. The student 'at risk' may be unclear and confused as to the nature of learning they should achieve at degree level and may fail to understand or accept the learning aims embodied within the range of teaching and learning methods adopted at university. It is argued that some students may be failing to understand or acquire the necessary skills: practical and intellectual which are required for successful study at degree level. It is suggested that students who are 'at risk' of underachieving or failure due to academic reasons, either fail to produce any

work or produce work which is too descriptive with little discussion lacking balanced argument supported by evidence. In short, the student often fails to: answer the question correctly; develop a good argument; provide a well structured essay, report or review; use evidence to support a view; include any depth of analysis and generally fails to apply and present his or her knowledge and research findings in the required or appropriate manner. In essence, they fail to recognise a need for their own intellectual development and the need to change their approach or attitude to the learning task.

2.5.4 The models as potential indicators of 'at risk' students

A main success of the Approaches to Studying Inventory has been in identifying the very successful candidates. However, its use as a predictor of less successful or 'at risk' candidates is less certain. The research workers at the University of Lancaster originally created the first ASI with the aim of identifying student academic performance, but later developed it as a tool for improving the knowledge of how students approach their studies. In theory, a student who has a 'meaning' orientation or a 'deep' learning approach to their learning should achieve higher grades and should be more successful compared to a student with a 'reproducing' orientation or 'surface' learning approach. However, from their studies, it was concluded that students who exhibit surface learning techniques still achieve good degree classifications. The ASI also attempts to categorise the student as being either a surface or a deep learner. In reality, a student can be both; adopting either a surface or deep approach to their studies as appropriate to the task involved. The ASI and the concept of approach to studying and learning may not be an appropriate line of questioning and this may be the fundamental reason why the ASI failed as an indicator of further student performance.

Perry's model on intellectual development attempts to categorise students in terms of a particular stage of intellectual development in contrast to Entwistle & Ramsden (1983) who attempt to describe the student's perception and approach to the learning task, but at a single instant in time without making any allowance for gradual intellectual development and an explanation of the overall learning progress.

However, even though the ASI and Perry's Intellectual Development model were not

originally designed as tools to identify student withdrawal or failure, it is suggested that there may be certain elements within the Approaches to Studying Inventory and Perry's Intellectual Development Model which can help in the further development of a new model of student underachievement, voluntary withdrawal and failure. To support this, Saljo (1979) and Entwistle & Ramsden (1983) have already demonstrated a connection between the student approach to studying and learning and intellectual development. Saljo (1979) conducted a series of interviews with mature-students and traditional students and noticed that the older, possibly, more 'intellectually mature' students recognised that there were different types of learning approach for different sorts of tasks. In contrast, the unsophisticated learner took their learning for granted as largely a rote-learning exercise (Entwistle & Ramsden, 1983).

Until the 1930's, research was unguided by an explicit theoretical framework, but it was largely concerned with linking the characteristics of students who withdraw. By the early 1970's a theoretical framework had been developed by Tinto (1975) which was based on the concept of social integration by Durkheim's study of suicide. Tinto (1975) held the view that students were more likely to drop-out of university if they failed to integrate into the social and academic life of the institution. The Tinto model was developed to introduce the background factors that may cause withdrawal (Thomas, et al, 1996).

A review of the work by Tinto provides a synthesis of recent theoretical research and an outline of the limits of existing theoretical research into student withdrawal and failure. Tinto acknowledges the relationship between: academic, intellectual and social integration and development, academic goal commitment, the level of student commitment to the university and the influence these factors have in determining student success or failure. Although Tinto took into account the attitudes, skills, abilities, commitments, value orientations and motivations, his work did not attempt to pinpoint the critical points of exit, unlike Perry who does attempt to include possible stages of withdrawal or retreat from studying. However, it is feared that the inclusion of a critical point of exit (i.e. escaping, temporising and retreat) by Perry is only an afterthought.

To date, the standard model of student non-completion is that of Tinto (1975; 1982; 1988). However, Tinto did recognised a need to further develop a new theoretical model on student withdrawal and failure, which would also explain the longitudinal process of interactions leading to a student either persisting or dropping-out of his/her course. In order to identify a student who is 'at risk' of underachievement, withdrawal or failure, further assessment needs to be conducted in an attempt to measure: (a) individual student attitudes to learning, (b) their approach to studying, (c) inherent skills, overall academic ability and previous academic attainments (d) the changing levels of personal commitment and motivation throughout the course.

Evidence continues to suggest that the decision to withdraw may be affected by the level of intellectual and social integration into the university (Tinto, 1982). Tinto (1975 and 1982) acknowledged the role of intellectual development in determining a successful or unsuccessful student and clearly distinguishes between the varying types of drop-out, especially between academic dismissal and voluntary withdrawal. Academic dismissal or failure is closely related to grade performance, but withdrawal appears to be related to a lack of integration between the individual and both the intellectual and social system within the university. In this respect, voluntary withdrawals are frequently found by those students who experience problems with regard to their social integration within the university. This contrasts with underachieving and failing students who are lacking in both intellectual and social development or are socially integrated to an extreme. Academically underachieving and failing students have often been found to be unable to balance the intellectual and social demands of university life and as a result of this failure in time management they fail to meet the intellectual or academic demands of their course. Tinto also suggests that the more time a faculty, department or school gives to their students, the more likely the students are to complete their education. Academically and socially, contact is an essential component of social and intellectual development (Tinto, 1982). However, this does not address the extent to which intellectual development is necessary for academic development.

By the early 1990's McKeown et. al. (1993) had reviewed the theoretical developments

made by Tinto and argued for an approach to the study of drop-outs which attempts to understand the actions of students in terms of the meaning of higher education to them (Thomas et. al., 1996).

2.6 The absence of a theoretical model

2.6.1 The need for the development of a 'new' eclectic theory

In the light of this, therefore, a need has been identified from the research literature for the development of a new theory on student withdrawal and failure which (a) will define and account for the wide variation in the nature of student withdrawal and failure, (b) will define and explain the *process* of student withdrawal and failure, explaining the origins and nature of student disengagement, (c) will look at the problem of student withdrawal and failure longitudinally, identifying the major critical points of withdrawal and failure and (d) will provide a new eclectic theory which will assist in the identification of students 'at risk' of withdrawing or failing their degree course. It is therefore suggested that theories by Perry (1979) on intellectual development, the early work on student drop-out by Spady (1970 & 1971) and the follow-on work by Tinto (1975; 1982 & 1988) specifically on student withdrawal and failure may assist in the development of a new theory on student withdrawal and failure for Higher Education in the 1990s.

2.7 The construction of a new model

2.7.1 Causes, critical points and processes behind non-completion

A most notable feature which came out of the review was the complex range of reasons given for student non-completion. As a result, it was decided that the way forward lay in a redevelopment of the intellectual development theory which would focus on the *causes* (the points within the degree programme which determine the level of success and, more importantly, the *critical points* of underachievement, withdrawal and failure). Once this is established, the *processes* which result in student underachievement, withdrawal and failure in Higher Education can then be determined. The way in which a student responds to the relativism which is part of the intellectual and social atmosphere of a pluralistic university may be important in an attempt to

discover why a student underachieves or is a high achiever at university. It is hoped, therefore, that by redefining Perry's theory in this way a new, but composite theoretical model may arise which identifies clear *crisis* points and describes more precisely the type of *negative coping strategies* which manifest and result in underachievement or failure. In addition, *positive coping strategies* will be developed to describe how high achievement evolves.

2.8 Benefits that could be gained from this new approach

The research will construct a composite theoretical model that will offer clearer information that could be used to advise academic and support staff who have an interest in why students underachieve or withdrawal from university.

It is predicted that this approach will highlight the main factors behind student achievement, underachievement, withdrawal or failure as a function of time. It is hoped that by studying individual student progression through a degree programme a clearer picture will evolve that will mark the actual processes that result in student underachievement or achievement, retention or drop-out - success or failure.

Chapter 3. Research Methodology

3.1 Introduction

The overall aim of this research investigation is to develop a clearer understanding of the various determinants of student academic performance and particularly - the problem of non-completion in Higher Education. As a result, a wide range of research methods have been adopted in this study due to the complex nature of the topic being studied.

3.2 Research Methodology

3.2.1 Quantitative and Qualitative data analysis

Researchers in Educational Development have discovered that they need to rely not solely on *quantitative* methods of analysis, but more importantly, *qualitative* methods of inquiry. In support of this argument that a qualitative approach is more meaningful than a quantitative one, Piaget concluded that thought and therefore the development of intelligence in younger children is *qualitatively* different from older ones, rejecting the *quantitative* definition of intelligence - an intelligence based and measured on tests and examinations (Ginsberg & Opper, 1979).

The work by Leitch (1994) on student non-completion, also suggests that a more qualitative approach to this type of study is important and points towards the adoption of a theoretical qualitative framework and that a rigorous qualitative methodology will be more successful in illuminating the process of intellectual development in a way that properly reflects different perspectives and experiences of learners. In the past, research projects of this nature depend on a purely statistical or atheoretical quantitative approach.

Given the number of variables that could be responsible for drop-out and

underachievement, a more complex theoretical approach is necessary. Furthermore the only true quantitative approach in these circumstances would be an experimental control paradigm, but this method has been rejected as inappropriate and unethical. Therefore, when designing a research project, it must be remembered that students at different stages of their studies meet different problems and challenges. This made it necessary to describe these problems with qualitative data analysis (Elkeland & Manger, 1992).

3.2.2 Descriptive research - longitudinal and cross-sectional

This research project utilises two types of descriptive research: longitudinal or the cohort method and a cross-sectional method. The term 'longitudinal' describes a research method which is conducted over a period of time with the same pool of subjects. In essence, a longitudinal study is a developmental study dealing essentially with human growth and development. In longitudinal studies or *repeated measures design,* successive measurements are taken at different points in time from the same individuals and this type of study involves the tracking of individuals over time. Conversely, a cross-sectional study or *independent measures design* analyses data collected from different individuals at different points in time (Kerlinger, 1964; Cohen & Manion, 1994).

However, as a result of the nature and availability of the data collected, and time constraints, a cross-sectional analysis has been adopted for the purpose of this study. This analysis involved the study of educational, intellectual and social development using both quantitative data analysis techniques such as psychometric tests or inventories and diagnostic tests and qualitative techniques such as selected one-to-one interviews.

3.2.3 Population and sample

A more homogeneous group was considered to be the most appropriate as the discipline background of the students are more important in this case. The degree programme in Building Technology and Management at the University of Glamorgan has in recent years suffered from a high level of withdrawal and also contains numerically based subjects which are giving rise to student difficulties.

The study is focused on one course: the BSc Honours Degree programme in Building Technology and Management which is offered at the University of Glamorgan by the School of the Built Environment (School of Technology - Division of the Built Environment). As a vocationally orientated degree course it attracts students from a variety of educational and experiential backgrounds. The type and standard of the pre-Higher Education qualifications held by entrants are therefore quite variable. A majority of the students enrolling onto the course do so via the Business and Technician Education Council with a Higher National Certificate or Ordinary National Certificate in either Building Studies, Construction or other related disciplines. In addition, students may also enter the course with Advanced GCE, City and Guilds, BTEC Higher National Diploma or overseas qualifications. In the past, research into the factors which determine academic performance and non-completion in the UK has been conducted by the 'old' or traditional university sector and as a result, these reports in the main, have concentrated on A' Level entrants.

The average age of the student group entering onto the degree programme in 1994-95 was 21 years 5 months with an age range from 18 years 3 months to 46 years 2 months. In 1995-96 the average age at entry was 22 years 6 months with an age range from 18 years 3 months to 47 years 4 months. The study therefore uses data from three cohorts from a single degree programme. Although this reduced the size of the sample in statistical terms, it allowed for greater in depth analysis of individual student data especially qualitative data which was felt to be more appropriate for the aims of this study.

3.3 Justification of the research focus - a qualitative research methodology

This research uses a sample which is atypical of the student population and it is clear that the findings from this study do not fully reflect the complete student body. This is because the research seeks to study the phenomenon of intellectual development in greater depth and to attempt to identify students 'at risk' through the model first developed by Perry (1970) which does include elements of withdrawal and failure, but not to any detail. This is also coupled with the work by Tinto on student withdrawal

and failure which presents a fuller model of students 'at risk', but does not explain the processes whereby a student becomes 'at risk'. To achieve this, a narrower focus of research was needed in order to study not only individual students, but the course within which they study.

It is argued that research which focuses upon the quantitative approach to this study, fails to address the complete problem and as a result tends to be overly descriptive. Although, description is good to some degree, it does not address the problem of *how* to help the student face up to the problems of studying at degree level. This is especially true for a multi-disciplinary/vocational degree programme such as the one adopted for this investigation.

3.4 Research plan

Reliance on an exclusive questionnaire/inventory type analysis was considered to be too simplistic and a more eclectic analysis was required. This analysis would be obtained by a combination of inventories, diagnostic testing and one-to-one interviews.

To achieve the aims of the research, every attempt was made to consider the whole student population on the degree programme. To achieve this, the researcher had complete access to all students studying for the BSc degree in Building Technology and Management. Permission was granted by the Head of Department for students to be approached and for questionnaires, tests and interviews to take place. A cross-sectional study was conducted and all Level One, Two and Final Year students on the course in 1995-96 were contacted from class lists prepared by their department. All tests and questionnaires were administered between lecture periods in an attempt to optimise use of the students', lecturers' and the researcher's time. This ensured the highest response rate possible, making the necessary follow-up interviews much easier. However, this procedure automatically introduces an element of bias in the sample as it only surveys those students who were present at that lecture. Attempts were made to identify those students who failed to turn up on the day of the survey. Where some students did respond to this request, many failed to submit a completed inventory form after the event.

The project design involves a case study of the incidence and experience of academic performance and therefore non-completion on a single degree programme. This has been achieved in three stages:

Stage One: the identification and collection of objective and quantifiable data held by the institution.

(1) Background information data

Individual student profiles were constructed from university databases. The first part of this data was taken from individual student files and the university records. The type of information acquired included: dates of birth, entrance qualifications and supporting information from references.

Further to this, all examination and assessment results were logged after each sessional period through University records. This information was later compiled to create individual student profiles which provided a comprehensive overview of how each student progressed through the course. This data collection included all students studying on the degree at the time of the survey and two full cohorts of students studying at the University in the years: 1994/95 and 1995/96.

Stage Two: the collection of data on Intellectual Development, the student approach to studying and a diagnostic test on mathematics.

(1) Approaches to Studying Inventory & Student Intellectual Development Inventory

All three cohorts of students were approached during the first two weeks of the first semester in 1995-96. Two questionnaires (1) a revised ASI and (2) a revised questionnaire on Perry, were administered to all classes of students for each year during a period of free-time between two lectures. The students were allowed 40 minutes to complete both of the questionnaires. The instructions asked the students to indicate their names on the completed questionnaires.

A revised version of the ASI was created from the original ASI as devised by Entwistle & Ramsden. The ASI used in this study primarily focuses on the 32 items and two sub scales as identified by Richardson (1990) on 'meaning' orientation and 'reproducing' orientation. Richardson (1990) questions the doubtful status of the sub scales used in the original and full ASI and as a result developed an abbreviated inventory which focussed upon just two fundamental study orientations - 'meaning' and 'reproducing' orientations. The Richardson's Revised ASI using just thirty-two items is the most reliable and reapplicable ASI currently being used within the study of student learning as an instrument for monitoring student study orientations. The shorter version of the ASI, as devised by Richardson, demonstrates a satisfactory level of retest reliability (i.e. a Cronbach score > 0.50) on both study orientations: meaning and reproducing and on all eight sub scales and on most of the thirty-two individual items. The Richardson version of the ASI contains four sub scales originally and empirically identified as meaning orientation (i.e. deep approach, comprehension learning, relating ideas and the use of evidence and logic) and the four sub scales which had been empirically identified with reproducing orientation (i.e. surface approach, improvidence, fear of failure and syllabus-boundness). The questions were presented in the same way as they appear in the original ASI and in Richardson's ASI. For each item the students were instructed to show the extent of their agreement or disagreement to each statement on a five-point scale from 5 for strongly agree, 4 for agree, 3 for not sure, 2 for disagree to 1 for strongly disagree. A copy of this questionnaire/inventory appears in Appendix C1.

A second questionnaire was devised from Erwin's Student Intellectual Development (SID). The original SID was considered to be too long - the original questionnaire was 115 items long and the revised version needed to be scaled down to a more manageable size of 40 items and 4 sub scales: 'dualism', 'multiplism', 'relativism' and 'commitment to relativism'. The question format for the SID questionnaire was slightly different. For each item the students were asked to show the extent of their agreement or disagreement to each statement on a four-point scale from 5 for strongly agree, 4 for agree, 2 for disagree and to 1 for strongly disagree. A copy of this questionnaire appears in Appendix B.

(2) Mathematical Diagnostic Testing

A mathematical test was given to all Level One students to diagnose individual strengths and weaknesses in the numerical ability of each student before they embark upon their Level One programme. The test was designed with the aim of identifying specific weaknesses in areas of experience and knowledge of essential mathematical concepts, required as part of a successful completion of the course. During induction week at the start of the academic year 1995-96, all Level One undergraduate students who enrolled on the BSc Honours degree programme in Building Technology and Management at the University of Glamorgan were asked to take a diagnostic test in building mathematics. The test given was specifically made up of relevant basic mathematical questions divided into eight main areas designed to test the students' knowledge and competence in: arithmetic, algebra, equations, scientific notation, indices, logarithms, graphs and trigonometry, thereby covering core material regarded as fundamental to the study of Building. A total of 28 students took part in the test which took 45 minutes to complete. The use of calculators was not permitted at any point in the test.

Stage Three: interviews were employed to obtain qualitative data from the students currently studying on the building degree, exploring perception and attitudes towards the institution and personal factors that might have an impact on completion. These include:

- financial status;
- contact and integration with academic staff and students;
- career aspirations;
- commitment to the subject (balance between practice and theory);
- perceived ability and motivation to complete the course (confidence);
- reasons for studying at the University of Glamorgan and enrolling on this course;
- student-course match and
- perceived threats to completion (possible critical points).

(1) Interviews

Interviewing

The research interview is a 'two person' conversation (Kvale, 1996), initiated by the interviewer for the sole purpose of obtaining research-relevant information. The content and structure of the interview is specified by the research objectives of systematic description and explanation. One advantage of the interview is that it allows for greater depth than is the case with other methods of data collection - quantitative or qualitative. A disadvantage, however, is that it is prone to subjectivity and bias by the interviewer (Cohen & Manion, 1994). A semi-structured interview technique was employed for this research project. The reason why a semi-structured type of interviewing technique was adopted was due to the comparative nature of the main aims and objectives of the research - to identify students 'at risk' of underachievement or non-completion of their degree programme. Thirty interviews were conducted during the research period. Each student selected for interview was contacted by academic staff in the School of the Built Environment (now School of Technology - Division of the Built Environment). The interviews took place within the same school in an available seminar room. The number of students it was possible to interview was controlled by a number of factors: the student's/researcher's time, the lecturer's time in organising each interview venue, time and date, occasional absences or refusals to attend the interview on the part of the student and an overall desire on the part of the researcher to keep the data collected under control and to a high quality. It should also be noted that data had already been collected on each student studied from alternative data sources, such as the University records database and from two inventories, one on Intellectual Development and the other on Approaches to Studying. During the interviews, an effort was made to avoid dichotomous items of questioning that only offer the interviewee two responses 'yes or no', 'agree or disagree' (Cohen & Manion, 1994). However, in some cases, some replies obtained from the students did contain negative or positive replies depending on the student's willingness or ability to give a more detailed answer.

A sample of students were selected for interview during the interim period between Semester A and Semester B in February and again at the end of Semester B in June,

just before the summer break. In terms of sampling, a stratified or quota sampling technique was adopted and this was achieved by selecting a number of five different *types* of students determined largely from data acquired during the first phases of the research programme (i.e. student database and Student Intellectual Development Inventory scores). Each interview was informal, but semi-structured and on a one-to-one basis, lasting approximately 20 to 30 minutes. The sample taken constituted 33 to 40% of each year group studying at the University of Glamorgan on the BSc Building Technology and Management degree programme in 1995-96. Interviews were conducted between February, 1996 to June, 1996.

3.5 Data consolidation exercise

This research relies on the eclectic collection and analysis of data. Data was therefore collected from different stages of the research and from a number of sources (personal data, examination results, diagnostic testing and inventories). This resulted in a complex collection of data which needed to be organised and utilised effectively before any theoretical modelling could be made. To organise this, initially the data was recorded on a class-by-class, level-by-level basis and then as an individual student profile. The data was then reduced and analysed.

Through phenomenological reduction (continual reduction of information gathered), the researcher can arrive at descriptions which allow entry into the actual experienced lifetime of the student.

The methodology adopted for this study involves:

- recording all the material gathered to get an overall sense of the material;
- developing a transcript of the interview and structuring it into appropriate sections;
- splitting a further division into meaningful units or categories;
- identifying possible themes from the meaning units or categories;
- sorting these themes into student groupings or typologies.

3.6 Problems of sorting and organising interview data

3.6.1 Background and inventory data

The first type of data to be collected was the background, inventory data and diagnostic test results. The background data consists of personal information such as: age at entry and previous academic performance. The inventories (IDI and ASI) and diagnostic test results were collected in Semester A in 1995-96. The results from these inventories and diagnostic tests were then analysed by level and an individual basis.

3.6.2 Interview data

Initially, data remains in the same form in which it was collected - pages of notes and interview transcripts. To begin sorting through the data, the author selected a few categories sufficiently comprehensive to allow for all data to be sorted, classified and categorised. During this process it was decided that the data being used was best suited to a manual form of data collection and manipulation. As a result, the most important pieces of data were recorded on individual cards (this allowed for better lateral viewing of the data held on the cards). In addition to this, each interview transcript summary consisted of one side of A4 only. Wolcott (1990) notes that the critical task in qualitative research is not the accumulation of masses of data, but the removal and disposal of most of the irrelevant data. This requires a constant refinement of the data collection so that it remains workable and manageable. This avoids the tendency by many, enthusiastic researchers, to collect and analyse excess data, both quantitative and qualitative.

The writing up of the results of qualitative research analysis or the *transforming* of qualitative data follows three processes: Firstly, a full DESCRIPTION of the data which consists of all relevant observations made by the researcher or reported to the researcher by others. Secondly, an ANALYSIS of the data and an identification of essential features and a systematic description of the interrelationships between them. Finally, an INTERPRETATION and an EVALUATION of the meaning of the interrelationships.

In other words, qualitative data is a circular process: describing, connecting and

classifying data and recognising how concepts interconnect. Analysis often starts during data collection. Qualitative data is produced through observation or successive interviewing. When dealing with qualitative data the first step is to classify the data. CLASSIFICATION or the interpretation and explanation of the data requires the development of a conceptual framework through which accounts of events can be produced in an intelligible form. After this comes some form of CATEGORISATION.

3.7 Classification methodology - reporting and analysis procedure

The interview data and background data was reduced and classified for each student using the following categories:

Figure 6

(1)	Background Data Interview Data	DESCRIPTION
(2)	Reduced Data	
(3)	Classification and Categorisation Identification of Themes (grouping of student typologies)	ANALYSIS
(4)	Conclusion Policy Making Report	INTERPRETATION

- Professional Features (cognitive and affective)
- General Features (cognitive and affective)
- Background Data (academic and personal background)

This can be broken down further to:

Professional Cognitive	-	awareness of skills, mathematical ability, approaches to studying
Professional Affective	-	motivation, integration (academic & intellectual), commitment
General Cognitive	-	intellectual, personal and professional development
General Affective	-	attitude, personality, integration (social)
Background Academic	-	pre-university education, work experience
Background Personal	-	age, sex, ethnic origin, residence as a student

Source and adapted from: Cohen & Manion (1994)

Chapter 4. Data collection - data analysis

4.1 Background Data 1994-5 & 1995-96

In the first phase of the research project, data was collected to illustrate the overall entry profile of the students who embark upon the degree in Building Technology and Management. This data highlights some of the differences that occur between individual cohorts and how dramatically the students on the degree programme can change from year to year.

4.1.1 Pre-Higher Education qualifications

	1994-5	1995-96
A' Level GCE	10.2%	41.9%
BTEC	83.7%	44.2%
Other	4.1%	12.9%

4.1.2 Referrals and passes

	1994-95	1995-96
Referred	9.5%	22.6%
Passed Level	90.5%	74.4%

4.1.3 Age profiles

	1994-95	1995-96
18-21 (traditional entrant)	94.9%	61.3%
22+	4.1%	34.7%

4.1.4 Gender

	1994-95	1995-96
Male	94.9%	94.8%
Female	4.1%	3.2%

4.1.5 Origin of candidates

	1994-5	1995-96
Wales	81.6%	64.7%
Rest of the UK	14.3%	22.6%
EU	2.0%	9.7%
Overseas	2.0%	0.0%

4.2 A Quantification of the problem

4.2.1 General non-completion rates 1994-6

In order to *quantify* the problem, a study of past non-completion rates was undertaken. The results are set out in Figure 7 which describes two phenomena: 'at risk' and 'non-completion'. To clarify Figure 7, the ' at risk' value is an estimated total of the number of students who are seriously close to failure. This total is made up of students who have been required to re-sit at least one module per semester. The 'non completion' figure is the percentage number of students who finally disappear from the degree programme either as a result of academic failure or through voluntary withdrawal. This value is therefore a percentage of the whole student population per level and not the percentage of the 'at risk' value.

Figure 7

Non-completion rates and Re-sit Rates

BTMD1 1995-96		**BTMD1 1994-95**	
Semester One		Semester One	
'At risk'	33.30%	'At risk'	12.50%
Non-completion	14.13%	Non-completion	13.21%

Semester Two	
'At risk'	14.50%
Non-completion	22.60%

Semester Two	
'At risk'	14.75%
Non-completion	20.75%

BTMD2 1995-96

Semester One	
'At risk'	4.30%
Non-completion	2.19%

Semester Two	
'At risk'	14.28%
Non-completion	0.00%

BTMD2 1994-95

Semester One	
'At risk'	4.25%
Non-completion	3.70%

Semester Two	
'At risk'	4.30%
Non-completion	4.20%

BTMD4 1995-96

Semester One	
'At risk'	14.0%
Non-completion	4.5%

Semester Two	
'At risk'	12.50%
Non-completion	0.00%

BTMD4 1994-95

Semester One	
'At risk'	4.75%
Non-completion	3.24%

Semester Two	
'At risk'	13.75%
Non-completion	1.25%

4.2.2 Summary of results

Results from calculating the total non-completion rates in the past two years show a wastage or non-completion rate well over the national average which is currently between 13% and 25% (Johnes & Taylor, 1989). The BSc (Hons) degree in Building Technology and Management suffers high non-completion rates for several specified reasons. Firstly, it is a multi-disciplinary course and to successfully complete it, a broad knowledge and skills base is required. Secondly, there has been a decline in the number of students who come from traditional backgrounds as recent efforts have been made to admit non-traditional students on to the degree programme. This has become more noticeable in the academic year 1996-97 when a significant number of students

have entered the degree programme with alternative pre-entry qualification (eg. from the humanities). Thirdly, accommodation has been a problem for students enrolling from outside the local area. From the results obtained. It is evident that they are at a greater risk of withdrawal or non-completion during the first year in Level One.

4.3 The known reasons for non-completion

4.3.1 Non-completion or withdrawal records for 1995-6

Data was collected throughout the study on the reasons why students withdrew from the Level One degree programme. This included two forms of data: (i) transcripts kept by the department itself and (ii) completed questionnaires received by the researcher. Two questionnaires were received during Semester A and B in 1995-94.

(i) The reasons cited for withdrawal as notified to Registry by the department in 1995-96:

- academic reasons;
- the wrong course (background in Humanities);
- transfer to another degree programme (Quantity Surveying);
- transfer to alternative university near home town (unsettled due accommodation problems);
- transferred to university near home town (unable to secure accommodation in halls) and
- student found the mathematics/science subjects too difficult.

The reasons cited for withdrawal as notified to Registry by the department in 1996-97:

- transfer on academic grounds to the School of Business Studies;
- the course did not match expectations;
- failed to return after the Easter break no replies to departmental communications;
- withdrawn due to unspecified academic reasons;
- transferred to another institution closer to home town;

- transferred on academic grounds - no specific details as to why and
- the student found the degree programme too difficult, particularly building mathematics.

(ii) Information obtained from survey questionnaires:

The questionnaire asked students why they had come to the university and why they wanted to follow the course. The students questioned chose the course because of the great expectations they had of it academically and vocationally, However, these expectations were not met. One did not like the academic area he had chosen and nor did he like the environment the university was situated in. It was the student's opinion that the university is in an area where the locals do not accept the students and the Students' Union has to provide all entertainment. In this case, the student recommended the course, but did not recommend studying at the university itself. The second student, found no interest in the course after six weeks of study. This student said the course was no longer *interesting* to him and that it was also *boring*. This student felt that the university student life was excellent, but that the university's location was poor.

The response rate for return of Withdrawal Questionnaire was very low at only two out of ten. This very low return rate is significant in itself. It is suggested that there a number of reasons for this: (i) a student who leaves is very unlikely to want to have anything to do with the institution he or she has just left. (ii) The ex-students are disinterested and apathetic about the whole student university experience and possibly even in their lives in general. (ii) The student may have left without conveying his/her address for correspondence since leaving the degree programme.

4.4 Pre-University Examinations vs. Academic Performance at University

As a vocationally orientated degree, the degree in Building Technology and Management attracts students from a variety of educational backgrounds, and as a consequence they arrive at the University of Glamorgan with a wide range of

knowledge and skills which may or may not be directly related to construction. The type and standard of the pre-Higher Education qualifications held by entrants are therefore quite variable. A majority of students enrolling onto the course do so via the Business and Technician Education Council (BTEC) with a Higher National Certificate or Ordinary National Certificate in either Building Studies, Construction or other related disciplines such as Civil Engineering. In addition, students may also enter the course with Advanced GCE, City and Guilds, BTEC Higher National Diploma or overseas qualifications. The minimum requirement for a student entering the degree course in Building Technology and Management is the achievement of at least two passes at Advanced Level GCE (a minimum entry score of 10 points, where a grade A=10, B=8, C=6, D=4 and E=2 points). The minimum entry requirement for BTEC HNC or ONC students is the achievement of at least 5 Level III Merit passes taken from a possible 8 units. Students entering onto the course with a BTEC HND may be admitted directly into the Second year of the programme.

In the past, lecturers have relied predominantly upon this record of academic achievement (A-Level and BTEC results and scores), when selecting prospective students. However, it is suspected that there is a poor correlation between pre-Higher Education academic achievement and academic performance at degree level and one important question therefore arises: To what extent can information related to academic performance obtained at intake be relied upon to predict later undergraduate academic attainment?

4.4.1 Methodology

The data for this analysis has been taken from Level One, Two and Final Year students - a total of 209 students. For ease of comparison, only students entering the course with either BTEC ONC/HNC or Advanced Level GCE's have been included in the analysis. Due to the variation between the grading schemes for each of these qualifications accepted at entry, the scores for Advanced Level GCE and BTEC ONC/HNC and HND have been normalised to allow for a more reliable comparison between students with these results. A new scoring system has been devised as follows:

Table III A Level and BTEC normalisation

A Level Grades		BTEC Grades	
A	10	Distinction	3.75
B	8		
C	6	Merit	2.25
D	4		
E	2	Pass	0.75

This assumes there is a maximum of 3 A level grades and 8 BTEC grades held by each student at entry

Similarly, a student with maximum A' Level scores would obtain 3 'A' grades or 30 points, similarly a student with maximum BTEC scores would obtain 8 Distinctions or 30 points. Alternatively, a student with a grade 'C', 'D' and a 'E' at Advanced Level GCE (12 points) would be more or less equivalent to 5 merits at BTEC (11.25 points). Finally, to complete the analysis, all course work and examination marks obtained from the end of Semester One were correlated against the entry score for Advanced Level GCE, BTEC ONC/HNC and BTEC HNC by using Pearson's Product Moment Correlation.

4.4.2 Results

Table IV shows the results of statistical testing using Pearson's Product Moment Correlation have produced a positive, but weak correlation between entry scores and academic performance at university averaged over the semester. From this result, it can be concluded that for this research project there is no strong evidence to support the argument that there is a clear relationship between entry score and subsequent academic performance at university.

Table IV Correlation between entry scores and end of Semester One examination performance at Levels One, Two and for Finals.

Level One	Level Two	Level Three
r = + 0.025	r = + 0.065	r = + 0.040

4.4.3 Summary of results

The results from Pearson's Moment Correlation have produced a non-significant positive relationship between the pre-entry qualification and results from Level One, Level Two and Final Year degree programme results. This provides evidence to support the assertion that there is little relationship between the attainment achieved before university and achievement at the University of Glamorgan.

4.5 Mathematical Diagnostic Testing (see test in Appendix A)

A mathematics diagnostic test was given to students on the Level One programme during the academic year 1995-94. The reason for choosing to develop this test was in response to changes in the abilities and knowledge possessed by undergraduates as they enter a degree programme. Over the last ten years or so there have been substantial changes in the content and context of pre-university level mathematics courses (Sutherland & Pozzi, 1995). Moreover, the increase in student numbers and the widening of access to Higher Education means that students are now being accepted onto degree courses in Engineering and Built Environment Courses with relatively low mathematical qualifications. In some cases, the mathematical background is negligible. As a result, many lecturers in Higher Education have become concerned at the variability of mathematical knowledge between their students and in particular the notable absence of a competence in algebra and trigonometry. The problem being exacerbated for those universities which take students with relatively low Advanced Level GCE grades and a higher proportion of BTEC entrants.

The reasons for this decline in mathematical ability may be attributed to two main reasons: (a) an increase in the number of non-traditional students entering Higher Education without the standard entry requirements and (b) the content of pre-university courses in mathematics. The national curriculum emerged as a response to employers' needs throughout the 1970's and 80's - largely in relation to developing applied mathematical skills rather than equipping students with a fundamental grounding in mathematics.

An analysis of pre-university mathematics courses reveals a decreasing emphasis on a number of traditional topics studied at that level. School mathematics, since the introduction of the General Certificate in Secondary Education, has shifted from the more analytical and abstract concepts of mathematics towards a more practical approach which can be related to everyday life. Approximately one fifth of the old O' Level GCE curriculum has been replaced by shape, geometry and statistical probability - the area of algebra being reduced to accommodate this change.

This problem may be more acute for vocational and professional degree courses, such as the Building Degree course at the University of Glamorgan, where the risk is that most students will proceed through the first and second years of study and to finally graduate, without being properly schooled in a level of mathematics essential for a career within the construction industry.

Assessing student capability

At present, the only indicator used to judge student mathematical capability at entry is their GCSE and Advanced Level GCE or BTEC grades. The minimum entry requirement for the Building Technology and Management degree is a grade C or above at GCSE. The obvious solution would be to only admit students with this level of qualification. However, three problems arise: (a) this would drastically reduce recruitment numbers (which are already falling) as many students currently enrol on the course without a GCSE in mathematics. In 1995-96 14.7% of the students who entered the degree programme did so without a GCSE or equivalent in mathematics. (b) there is no evidence to support an argument which states that a student with a grade C at

GCSE will not experience difficulty with building mathematics at degree level and (c) there are two levels at GCSE - the Higher and the Intermediate level, and there is rarely sufficient information to determine whether the student has studied for the Higher or the Intermediate level paper at entry.

In addition to GCSE grades, students are enrolled on the Building Degree Course from the BTEC Construction and Building Studies route. As a part of this route, many students study building mathematics and surveying techniques, but the actual quantity and depth of tuition cannot be guaranteed. However, students who enter via the traditional Advanced Level or non-traditional route are more likely to be the students who do not possess adequate mathematical training or knowledge for a degree in building.

Aims and objectives

A basic level of numeracy is essential for success in both the study and practice of Building. From experience, academic staff have found that many students have struggled with subjects such as structures, environmental science, surveying, building services and materials because they possibly lack sufficient knowledge and competence in the use of mathematical equations which are essential in many applications of these subjects. Therefore difficulties are experienced not because the concepts are necessarily difficult, but because the students are lacking basic relevant mathematical techniques to solve the problems set.

A mathematical test was given to all Level One students to diagnose individual strengths and weaknesses of each student before they embark upon their Level One programme. The test was designed with the aim of identifying specific weaknesses in areas of experience and knowledge of essential mathematical concepts, required for the study of Building. During induction week at the start of the academic year 1995-96, all Level One undergraduate students who enrolled on the BSc Honours degree programme in Building Technology and Management at the University of Glamorgan were asked to take a diagnostic test in building mathematics. The test given, was specifically made up of basic mathematical questions relevant to the building degree programme. The paper

was divided into eight main areas designed to test the students' knowledge and competence in: arithmetic, algebra, equations, scientific notation, indices, logarithms, graphs and trigonometry - covering core material regarded as important elements of building mathematics. A total of 28 students participated in the test which took 45 minutes to complete. The use of calculators was not permitted at any point in the test. A copy of the test appears in Appendix A.

The main objective was to identify fundamental and often common weaknesses in mathematical ability with the aim of addressing the problems encountered and to provide specific information which may assist lecturing staff in the preparation of additional study material and possible changes in course delivery. It is recognised that the time available in the first year of a degree programme may not allow for extensive coverage of all the basic principles of mathematics required for studying a degree in building and it is therefore important for the numerically weak students to be given additional support in identifying areas of deficiency. The final aim of the test was to collect further information which could be analysed and used in the preparation of additional study material and possible changes in module/course delivery. In addition, interview transcripts will be analysed to further identify contributory factors relating to problems in the use of mathematics on the Course.

4.5.1 Main results

The test was marked by giving an overall percentage mark for each student. The average mark was 33.5%. However, interesting observations were noted when marking the scripts. It was evident that many students had particular difficulty with questions on: algebra, trigonometry, logarithms and in the use of equations and indices. More specifically in the areas of: changing the subject in equations (Q.5 see Appendix A), the use of indices (Q.7), logarithms (Q. 8 & 9) and the equation of a straight line (Q.10).

The results obtained from the diagnostic test were analysed against subsequent examination and course work results for modules taken at Level One in 1995-94. The most important module for consideration is the Level One module in "Building

Mathematics and Computing" taken in Semester A. "Environmental Science and Building Services" and "Structures and Materials" (taken in Semester B), have also been referred to in an attempt to identify possible weaknesses in the student's subsequent academic performance which may be due to an inadequate grasp of required numerical and mathematical skills.

Table V Level One 1995-96 - Building Mathematics - Pearson's Product Moment Correlation

Semester A		
Building Mathematics & Computing	+0.09	n=18
Introduction to Science Materials & Structures	+0.17	n=18
Semester B		
Environmental Science & Building Services	+0.31	n=17
Structures and Materials	+0.11	n=17

4.5.2 Interview transcripts

Interview transcripts were also analysed to further identify contributory factors relating to problems in the use of mathematics on the degree programme. The information for this was taken from the main interview data collected in Semester B. The students in Semester B were asked a number of questions related to the student academic performance, including their ideas and experiences with building numeracy and building mathematics. (The results of these interviews are discussed later in section 4.7). Mature students identified specific problems with algebra and put this down to a lack of confidence in their own ability to cope with the problem, rather than a lack of ability. One traditional entrant (18 year old) noted that mature students tended to struggle more with the mathematics component of the course....

> "People with work experience (those from industry) struggle more with maths"
>
> Another said there was ..."too much maths in the course".

Students from the BTEC OND/HNC in Construction or Building Studies routes tended

to feel more confident about their ability to cope with the mathematical elements of the Course because these vocational pre-entry courses had already covered the basics in building mathematics, but one of these students still felt that the Level One Module in "Building Mathematics & Computing" "...maybe taught a bit too fast..." One traditional entrant remembered a dislike for mathematics at school "...I didn't like maths at school... I think you either have the ability or your don't..."

4.5.3 Summary of results

The mathematics tests given to seventeen students at Level One in 1995-96 during Induction Week. This tests produced a weak, but positive correlation when matched to the results obtained from the Level One module "Building Mathematics and Computing" ($r = 0.09$).

4.5.4 A critique of the mathematical diagnostic test

The overall validity and reliability of the mathematics diagnostic test is questioned for two reasons. Firstly, the test may not be directly comparable to the type and level of numeracy and mathematics later tested for in the Level One end of semester examinations. Secondly, the test is suspected as being too hard in comparison to the general starting ability of the intake in 1995-94.

The overall use of this particular diagnostic tool is therefore possibly limited in its reliability and success as an indictor of a student academically 'at risk' in this important area of the degree programme. There is a tendency to believe that the overall assessment marks for Semester A and B in Level One may be the better method for assessment and the prediction of future learning difficulties and academic performance above any form of entry examination or diagnostic testing system. It is further suggested that the School of the Built Environment (now School of Technology - Division of the Built Environment) could adopt a continuous assessment system which would run parallel to the existing assessment regime and one which would continuously inform tutors of any sharply declining performances. This type of assessment would serve to act as a 'check' in the teaching and learning system and one which could be used to inform tutors as to what action could be taken to remedy

declining performance and therefore poor learning quality.

4.6 The study of Intellectual Development (see Appendix B)

Two inventories were created and employed during the process of this research: the Intellectual Development Inventory (IDI) and the Approaches to Studying Inventory (ASI). The two inventories were chosen in an attempt to redefine, pin-point and illustrate the development of both individual students and of the class as a whole. The inventories were seen as research tools which could be utilised to measure individual levels of commitment to the course and the subject, and to identify types of motivation and investigate how this changes over time. Furthermore, the inventories investigated how the students approach to studying is reflected in their performance, and how changes in intellectual development and approach determine the students' level of performance.

The Intellectual Development Inventory (IDI) was based on the work by Perry (1970) and on the later work by Erwin (1981 & 1982). The concept of student intellectual and social development as devised by Perry (1970) is important in this research as it is a model which incorporated the idea of student withdrawal and failure under the headings of: "temporising", "retreat" and "escape" (see Figure 4). The study of student intellectual and social development was also considered an important starting point for this research as Perry's ideas on intellectual and social development naturally provides the foundation from which further research could develop on student progression and retention in Higher Education.

The IDI was issued to all students, in all years during the academic year 1995-94. A copy of the inventory used is shown in Appendix B1.

4.6.1 Summary of class results for the IDI

The results obtained via this revised inventory (IDI) are outlined below:

	Level One	Level Two	Level Four
Dualistic	32	24	28
Multiplistic	40	30	31
Relativistic	34	27	27
Commitment to Relativistic	33	28	31

4.6.2 First Year 1995-6

Twenty-two students completed the Inventory for Intellectual Development (see Appendix B2) in the first Semester, Semester A of 1995-4. The class of 1995-6 scored more in the "Multiplistic" stages of Intellectual Development. This supports Perry's theory which suggests that withdrawal or failure occurs between the "Dualistic" and "Multiplistic" phases of the model.

4.6.3 Second Year 1995-96

Sixty-two students completed the Inventory for Intellectual Development (see Appendix B2) in the first Semester, Semester A of 1995-94. The results for Level Two, overall, produced a wider spread of results with a majority of the scores being either "Multiplistic" (35%) or "Committed" (32%).

4.6.4 Final Year 1995-96

Forty-nine students completed the Intellectual Development Inventory in Semester A in 1995-4. Forty percent of the students studied scored high on the "Multiplistic" side and 51% scored high on "Committed". In the third year, it was also noted that an overseas student scored both high in the "Dualistic" category and in the "Committed" category. This indicates the influence of culture on how a student may develop intellectually.

4.7 Approaches to Studying Inventory

4.7.1 Introduction

Richardson's Approaches to Studying Questionnaire or Inventory has been used to test three elements of study. The three elements of this Inventory were tested: orientation (meaning or reproducing), approach (surface or deep) and motivation (intrinsic, extrinsic and achievement).

4.7.2 Approaches to Studying Inventory results (average scores)

Level One - 1995-96

Meaning Orientation	41.90
Reproducing Orientation	41.05
Deep Approach	11.14
Comprehension Learning	9.86
Relating Ideas	10.68
Use of Evidence	10.68
Surface Approach	14.68
Improvidence	9.00
Fear of Failure	4.77
Syllabus Bound	10.68
Intrinsic Motivation	9.00
Extrinsic Motivation	11.32
Achievement Motivation	4.86

Level Two - 1995-96

Meaning Orientation	34.49
Reproducing Orientation	34.37
Deep Approach	14.36
Comprehension Learning	13.38
Relating Ideas	14.08
Use of Evidence	13.73
Surface Approach	14.52
Improvidence	14.08
Fear of Failure	10.64
Syllabus Bound	11.58

Intrinsic Motivation	12.83
Extrinsic Motivation	14.95
Achievement Motivation	13.77

Level Four - 1995-96

Meaning Orientation	44.03
Reproducing Orientation	51.45
Deep Approach	14.29
Comprehension Learning	14.40
Relating Ideas	14.63
Use of Evidence	12.88
Surface Approach	14.10
Improvidence	11.00
Fear of Failure	9.27
Syllabus Bound	11.29
Intrinsic Motivation	14.12
Extrinsic Motivation	12.88
Achievement Motivation	14.59

4.7.3 Approaches to Studying Inventory - an explanation

In Level One, there is no clear distinction between 'meaning' and 'reproducing' orientations. When this is broken down, the meaning and reproducing orientation sections reveal some interesting results. For meaning orientation, there are four sections or sub-sections: deep approach, comprehension learning, relating ideas and the use of evidence. For reproducing orientation, there are again four sections or sub-sections: surface approach, improvidence (the tendency to stick to the main core of the subject area), a fear of failure and syllabus boundness. It is evident that in Level One a majority of the students studied have a surface approach or a rote-learning approach to their work. In terms of motivation, there is a tendency for Level One students to be extrinsic in their approach.

In Level Two, 'meaning' and 'reproducing' orientation is similar, but in comparison to Level One, the students in Level Two also have a surface approach to learning. In terms of motivation, in Level Two, student motivation again is largely extrinsic.

In Level Four (the Final Year), the students tend to be 'reproductive' in their approach to learning with a slight tendency to have a surface approach to learning. Of particular significance, there is a change in general motivation from extrinsic to achievement and intrinsic motivation. However, this may be related to increased student maturity, both in the personal and academic sense.

4.7.4 Discussion of results

Results from analysis of the Approaches to Studying Inventory (ASI) for Levels One and Two have produced very similar results. However, for Level Four (the Final Year) there is a marked change in the way the students work, study, think and in the way they are motivated to work. In terms of studying approach, the students under review tended to possess a surface approach to learning. The most significant factors for change are evident from the study of student motivation. In Levels One and Two, the students, as a whole, tend to be extrinsically motivated (i.e. they are studying for a degree for external reasons - because their parents want them to or because they are personally committed to following a graduate career in the building industry). By Level Four (the Final Year), the students' motivation has slightly altered and as a group, they tend to be more intrinsically or 'achievement' motivated. One reason for this lies in the sandwich nature of the degree programme. Many students follow this route and it significantly increases the students' self-awareness and underlines the students' personal determination to embark upon their chosen career, which they now have greater knowledge and experience of. Students in Level Four have also switched from being extrinsically motivated to being intrinsically and achievement motivated. At this point, they are studying for their own interest and as a result of an increasing self-confidence in their own determination and ability to succeed. These results also compare to the results obtained from the Intellectual Development Inventory (IDI) which seems to agree with the theory first proposed by William Perry which suggested that all undergraduates are likely to also reach an advanced intellectual level of cognitive

processing by the end of the degree programme. In this case, they remain largely multiplistic in their thinking, but this thinking also shows signs of being at the higher level of commitment. For each year, 'at risk' students were identified from their Semester One scores and compared to the results given in corresponding questionnaire or inventories.

4.7.5 'At risk' Results - First Year 1995-6

In Level One, nine students (33%) were identified as being 'at risk'. The results from comparing the students' status in the class profile and the information given in the inventory was as follows:

(1) Surface approach, extrinsic motivation and meaning orientation

(2) Surface approach, achievement motivation and meaning orientation

(3) Surface approach, intrinsic motivation and meaning and reproductive orientation

(4) Surface approach, achievement motivation and meaning orientation

(5) Surface approach, extrinsic motivation and meaning orientation

(6) No Inventory received

(7) Deep approach, extrinsic motivation and meaning and reproducing orientation

(8) Deep approach, extrinsic motivation and meaning orientation

(9) Deep approach, extrinsic motivation and meaning orientation

From theses results taken off individual inventories it is evident that there is no pattern in orientation, motivation or approach to studying.

4.7.6 'At risk' Results - Second Year 1995-6

In Level Two, six students or (4.3%) were identified as being 'at risk'. The results from comparing the students' status in the class profile and the information given in the inventory was as follows:

(1) Surface approach, intrinsic motivation and meaning orientation

(2) Surface approach, extrinsic motivation and reproductive orientation

(3) Surface approach, achievement motivation and meaning orientation

The remaining three did not respond.

4.7.7 'At risk' Results - Final Year 1991-6

In Level Four, nine students (15%) were identified as being 'at risk'. The results from comparing the students' status in the class profile and the information given in the inventory was as follows:

(1) Surface approach, extrinsic motivation and meaning orientation
(2) Surface approach, achievement motivation and meaning orientation
(3) Deep approach, achievement motivation and meaning orientation
(4) Strategic approach, extrinsic motivation and meaning orientation
(5) Surface approach, extrinsic motivation and meaning orientation

The remaining four did not respond. The poor response, approximately 50%, from 'at risk' students is notable.

4.8 Interviews & background data

4.8.1 Factors that may determine academic performance

At university, many factors determine the final outcome in terms of a student's academic performance. The reasons for non-completion and underachievement are particularly complex. Traditionally, it is believed that several main reasons come into play when determining academic success and therefore retention in Higher Education: finance, health (mental and physical), the nature of university life, and more importantly, the match between student to course and the student with the university. Thomas, Adams & Birchenough (1996); University of Wales - Institute Cardiff (1997) and HEFCE (1997) suggest that many students temporarily withdraw from their studies due to bad advice and poor decision making at entry and therefore a mismatch develops between the student's personal, academic and vocational aspirations and the degree course chosen. This is supported by the fact that many students then re-enter higher education and enrol on another degree programme at the same institution or elsewhere.

As a result, the data collected in this research was reviewed and a search was made into identifying factors which influence student academic performance. From this study a broader set of factors have been identified and are summarised below. These factors have been divided into negative and positive influences:

4.8.2 Negative Factors

- **Residence**
  many prefer to be in Halls or in 'trouble free' accommodation in the first year
- **Earning money in place of studying**
  working vs. studying dilemma
- **Examination technique**
  this includes mental attitudes: panic, timing, mental blocks and general excitement
- **Practical vs. theoretical conflicts**
  the acceptance of the course as being relevant to practice
- **Academic Background**
  type of qualification; not the level of pre-entry qualification
- **Mathematical ability and knowledge**
  students reported feelings of inadequacy - and a lack of confidence in ability
- **Excessive tuition - too much information in too much detail**
- **Workload too high**
  course work is stressful and may take too long to complete
- **Return from placement (Level Four)**
  students reported feeling of being slightly disorientated after working for a year in the industry.
- **Lack of confidence**
- **Little private study done in Level One**
- **Little or no experience in the subject area**
- **Choice of University and its location**
  the university is a little isolated

These points have been identified as the key factors which may influence a 'down-turn' in academic performance and in the extreme case - a student 'at risk' of not succeeding in a single module or the whole level.

4.8.3 Positive Factors

- **Motivation and commitment:**
  career aspiration, family in construction, practical experience of building industry
- **Work experience in the construction industry before and during the course**
- **Clear career aspirations and high intrinsic motivation**
- **The excitement of a new challenge**
- **Motivation high (Level Four)**
- **Return from placement (Level Four)**
  students report an increase in motivation after being in industry for a year
- **Commitment to course/personal and career aspirations**
  student course match?

These points have been identified as the key factors which may enhance and improve the student's academic performance.

The points identified in this part of the research inquiry only give a guide to the reasons which influence student academic performance on the Building degree either in a positive or negative way. Over the three years of study on a degree programme the student's situation may change with circumstances. Many of the factors identified are 'psychological' in their nature: alternating levels of commitment, motivation and re-adjusting to new work and study habits are the primary criteria linked to the successful completion of a degree course.

4.9 Interview reporting, categorisation and analysis

4.9.1 Introduction

During Semester B in 1995-96, a selected number of students from each year group was interviewed. The sample of students were chosen by analysing their pre-university education, their university education examination results and other held data to obtain a representative range of backgrounds. An even sample was then taken which would cover the whole academic performance range. In Level One, eight students were approached by a staff member of the School of the Built Environment (now School of Technology - Division of the Built Environment) and each interview lasted for twenty

minutes. In Level Four, fifteen students were invited to an interview. The interviews took place within the School of the Built Environment (now School of Technology - Division of the Built Environment). A main problem which arose during the interview period was a reluctance by some students to actually attend the session arranged for them.

4.9.2 Classification Methodology - reporting and analysis procedure

The interview and background data was translated into a different form by using the categories set out above. Each student profile was set out under the following headings or groups of information: Professional Cognitive (awareness of skills, mathematical ability, approaches to studying), Professional Affective (motivation, integration (academic & intellectual), commitment), General Cognitive (intellectual, personal and professional development), General Affective (attitude, personality, integration (social)), Background Academic (pre-university education, work experience) and Background Personal (age, sex, ethic origin, residence as a student). Source and adapted from: Cohen & Minion (1994).

4.9.3 The categorisation of data - grouping of student typologies

The collection of case studies was then analysed a second time and each case study was categorised into four student typologies:-

(a) Student 'at risk'
(b) The Successful, Average, but Erratic Performer
(c) The Successful, Average, but Stable Performer
(d) "High Flyer" (potential first or high upper second class degree)

For each of the four categories, a number of key factors have been identified which provide some indication why a particular individual performs at that level (i.e. why one student is 'at risk' of non-completion and why another, studying an identical degree programme, is floundering).

This form of categorisation has been used to develop the theoretical framework and it

seeks to break the problem down to an individual student level identification of the type of student academically 'at risk' from qualitative data sources and not purely statistical information, such as entry qualifications and early examination results. This part of the theoretical framework (Chapter 5) relies on three successful student typologies and one 'at risk' category.

Interview and Profile Data - The Categorisation of Individual Student Data

Level One 1995-96

Case Study One (At risk)

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

no private study - studies alone
learns by rote - surface learner
problems with maths - no ability - work experience (industry) struggles more with mathematics
Environmental science - tends to be hard - it is new to me
"..didn't know what to expect in the exams - bit of a surprise really.."
lecturers not aware of my background
"I got into good habits at the beginning of the year. I don't leave things to the last minute like some do."

Professional Affective (motivation, integration (academic & intellectual), commitment)

Commitment: extrinsic motivation; family are in site management.
Attitudes to staff: The lecturers know better than I do. I don't know the subject area to argue with them. Integration: I need more feedback, I got a poor mark, but no comment as to why it was poor. Attendance: I cannot afford to miss any lectures etc. I try to go to everything. Semester A to Semester B: Is it harder?

General Cognitive (intellectual, personal and professional development)

Semester A: 5559 = 6 (at risk)
Semester B : 6975 = 4.75 (at risk)

What stands out for you this year? I have a feeling of apprehension, most of the other students seem to be from BTEC.
Intellectual Dev: At school it was very different - essay driven; this is more factual; and I need to memorise things more

General Affective (attitude, personality, integration (social))

first expectations? course is too theoretical; too much maths; too academic and not practical enough.

Background Academic (pre-university education, work experience)

works part-time
I don't think I could have coped with the course unless I had some experience of building.
1st choice of university (local). A Levels: History, English & Welsh - change from A Levels in Humanities to doing a degree in Building - it is more practical - I want to work in this area (vocational)

Background Personal (age, sex, ethic origin, residence as a student)

Age: 23 1mth
accommodation: No, my flat mates study hard - 7-8 hours per week - real swots. Lives in Hall

Critical Points:

no serious thoughts of giving up - at the beginning maybe; transition from studying literature to science took a long time probably it took longer for me to adapt than other students.

Case Study Two

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Semester A: 14 11 8 10 = 10.7
Semester B : 10 10 9 12 = 10.25

change from A levels that were theoretical to something which is practical
50/50 effort and application.
Academic difficulties: mathematics and Environmental Science in module in Level one
I also find the course is very 'dry' and full of facts

Professional Affective (motivation, integration (academic & intellectual), commitment)

"I accept it for what it is..." (dualistic? attempting to move to multiplism).
Commitment/motivation: A career in building
Integration: I have no idea of what is expected of me - this worries me a bit.

General Cognitive (intellectual, personal and professional development)

Examinations: I can develop an argument, but I have been told to be more committed in my answering of questions.
Intellectual Development: A' Level psychology opened up my thought processes. I expected the course to be more dynamic - it is very dry. I am trying to make it more dynamic - remove the dullness. Law and economics is good - it is related to the real world. I don't think I will use the technology side.

Background Personal (age, sex, ethic origin, residence as a student)

Age: 20 6mths
" I think financial problems are an excuse, not a reason of difficulty".
Different academic background: A' Level Sociology/psychology

Critical Points:

Occasionally thought of giving up due to work and family pressures.
Not earning money is a problem for me

Case Study Three

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

one to one at college, it took about a month to adjust
Learning: 10 hours private study
Academic Difficulties: None, but experience of building is definitely needed for this course
Examinations: excited about sitting exams, but this lead to panic
Coursework: this takes up too much time.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Commitment/motivation: family in the building industry
Getting too old - need to do a degree now to get a job. I don't want to be doing physical work when I am older. I am looking towards a managerial position.

General Cognitive (intellectual, personal and professional development)
Intellectual Development: no change, too much information to absorb, concerned with the mechanics of learning. ie surface approach.

Background Academic (pre-university education, work experience)
A Levels - 1 only (E)

Background Personal (age, sex, ethic origin, residence as a student)
18 4mths

Critical Points: No! never. It would be a waste of time to give up.

Case Study Four

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
I took a year out before degree
Learning: works alone, works to deadlines
family/friends: are very supportive, possibly deep learner
Problems with Building Economics. It is a different subject area for me.
Examinations: revised well, read past papers, but ran out of time for one question in the exam, I panicked at the start.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Attitudes to staff: gets on well with staff
prefers lectures to be in blocks eg. two days a week
Commitment: good job with a decent wage, need to do the course to get a job, I want to work in site management.
Expectations: like BTEC
Integration: understands the assessment system - knows what is expected most of the time.

General Cognitive (intellectual, personal and professional development)
Intellectual Development: difficulties with writing, attitude has changed - enjoy studying now, read more and make notes more. Do extra reading for project. I devise my own work schedule now. (accepts responsibility for own learning).

Background Academic (pre-university education, work experience)
BTEC Construction

Critical Points: No, I have never thought of giving up. Girlfriend is very supportive

Case Study Five

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
very similar learning experience to before
Learning: studies with friends, help each other in gathering information
Academic difficulties: different, more relaxed than at school - had more help before
Examinations: easier than expected

Coursework: find it difficult to motivate myself and get down it it

Professional Affective (motivation, integration (academic & intellectual), commitment)
Semester A: 11 10 10 11 =10.5
Semester B : 9 9 9 10 = 9.25

Integration: most of the time it is very straightforward. However, I do struggle with some pieces of work. I would prefer some more hands on experience (practical).

General Cognitive (intellectual, personal and professional development)
Intellectual Development: work has changed - noticed no change

Background Academic (pre-university education, work experience)
What stands out for you this year? Not as expected. But a good foundation for a degree.

Background Personal (age, sex, ethic origin, residence as a student)
Personal: lives at home, but feels he is missing out on something.

Critical Points: Critical Point: very determined to carry on. Never thought of giving up. However, would rather be working in a job.

Case Study Six

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
lack of practical - hands on experience
I work with others - discuss the problems with others
Learning: seek to understand what I am working on (deep learner)
Academic difficulties? resits on module - materials
Examination: it went well, but failed one unit through lack of work

Professional Affective (motivation, integration (academic & intellectual), commitment)
Integration: Assessments a bit vague

General Cognitive (intellectual, personal and professional development)
Semester A: 10 5 12 11 = 9.5
Semester B : 10 9 10 8 = 9.25

Intellectual Development: failed last year's resits - it was humiliating, but I learnt a lot through the experience

Background Personal (age, sex, ethic origin, residence as a student)
Age: 24 9 mths/mature
no accommodation worries, live in Halls which is essential for all first years
made friends/enjoys living away from home.

Critical Points: there haven't been any times when I have felt like giving up.

Case Study Seven (At risk)

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
too much theory.
Your are treated better - more mature approach. I wasted a year at school doing resits.

Learning: works when there is a deadline, studies alone, but sometimes with others
Academic difficulties: not yet
Examinations: need more help with exam technique.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Semester A: 7,7,9,5 = 7 'At risk'
Semester B : 6,6, 8, 9 = 4.25

Commitment/motivation: career in building (extrinsic) Did HND and this seemed to be a natural progression. I am interested in all aspects of building, but especially in design.
Integration: academically - Things are usually explained well.

General Cognitive (intellectual, personal and professional development)
Intellectual Development: I work a lot more in the library now than I did at school. More mature in my approach to studying. I study when necessary.

General Affective (attitude, personality, integration (social))

Background Academic (pre-university education, work experience)
Education: A levels - 2 D's

Background Personal (age, sex, ethic origin, residence as a student)
Age: 18 4mths. Personal: I live at home with my parents.

Critical Points: Have you ever thought of giving up? No not yet (laughs)... coursework stresses me out, but I pull though.

Case Study Eight (At risk)

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying) The lecture on cement was too detailed - too academic, course has been rather general
more open (at college it is more one-to-one), here it is difficult to get in touch with the lecturers
in University on two days a week - this is a good use of time - lectures are in blocks
I do not have enough knowledge of the area to do this.
too mathematical, definitely need experience of building to do this course.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Semester A: 5, 11, 5, 9, = 4.5 'At risk"
Semester B : 6, 5, 9,10 = 4.5

Commitment/motivation: to get a job in building, feel I should be doing something as time is pressured. (student older than usual), aware that a degree won't guarantee a job, Family is in building. Integration: no standards are really set. Not rewarded in the first or second year.

General Cognitive (intellectual, personal and professional development)
Intellectual Development: greater use of common sense - it is quite straight forward. My brain is more active no - a lot of information to take in. I feel more alert to things.
Examinations: Focused on what had been taught used lecture notes a lot, took too long on one question

General Affective (attitude, personality, integration (social))
Attitudes to staff: never question the lecturers (need to gain a certain amount of knowledge, before you can question what is being said or written about).

Background Academic (pre-university education, work experience)
Education: A levels 3 E's

Background Personal (age, sex, ethic origin, residence as a student)
Age: 20 1 mth.
Personal: I have financial problems, but this doesn't effect my work here.

Critical Points: In the exam I had a mental block - I knew the answer, but couldn't get it down. I was very hyped up for the exams. The first year work is not too easy. A lot of work in a short space of time. No knowledge of how to do lab work or a report - found it difficult to grasp how to do it.

Level Two 1995-96

Case Study One

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
No problems with numeracy or in the use of calculators.
Degree is too theory based.
I work with a group of friends and did a lot of revision, but it didn't sink in.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Commitment/motivation: motivated towards getting a qualification in building management. This student does not want to be in manual work when 40.
Academic Integration: The amount of detail in the degree is too much.

General Cognitive (intellectual, personal and professional development)
understand the management side of building more
the second year is very similar to the second year on the HND course.
In Semester A I was pleasantly surprised, but I did not do as well as I had hoped. I thought I had failed.

General Affective (attitude, personality, integration (social))
enjoys working in building - it is creative, lives in Cardiff so limited social integration with the University.

Background Academic (pre-university education, work experience)
Work experience - 10 years on site work.
HND from UofG and A' Levels were a waste of time (Maths and Geography). I had very little motivation then - I couldn't be bothered to work.
a late applicant to the UofG

Background Personal (age, sex, ethic origin, residence as a student).
Lives in Cardiff and originally from Cardiff.

Critical Points:
never thought of giving up - It would be a waste of time. I have got so far in two years.

Case Study Two

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Works well in group work.
For assignments, I work mostly on my own unless it is group work.
I have no problems with mathematics (building). I did okay at school with maths, so it is no problem.

Professional Affective (motivation, integration (academic & intellectual), commitment)
I believe I have progressed. I certainly have a better knowledge of building, especially in contracts which I largely self-learnt.

General Cognitive (intellectual, personal and professional development)
There are conflicts with both the real situation and on the course.

Background Academic (pre-university education, work experience)
Works P/T and did an HNC by day release. In Semester A the same work is covered in the HNC. Semester A examinations went okay and I was fully prepared for them

Background Personal (age, sex, ethic origin, residence as a student).
Student is male. Student is from Rhymney Valley and has always lived locally.

Critical Points: Have you ever thought of giving up? Not yet! Too much time has been put into my training, by myself and the company I work for.

Case Study Three

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
ONC/HNC start at Pontypridd College.
I went straight into the Second Year. (The course before (ONC/HNC) was very varied and not in so much depth. We do a lot of group projects and this is more like a real situation.

Professional Affective (motivation, integration (academic & intellectual), commitment)

General Cognitive (intellectual, personal and professional development)
I feel, personally, more mature. I would also consider myself to have a broad mind. This student fully understands Perry's model on Intellectual Development - this student is probably multiplistic. Group work is encouraged and I have no problems working with other students. Do you believe certain 'personalities' are attracted to building? Yes, I do.

General Affective (attitude, personality, integration (social))
Does not integrate with the social/life in the University

Background Academic (pre-university education, work experience)
I have worked P/T.
Background Personal (age, sex, ethic origin, residence as a student).
Male, lives in Cardiff

Critical Points: No - never

Case Study Four

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

HNC Level Two entry. This student believes the mathematics component of the course is insignificant. Works full-time.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Seeks promotion and enhanced financial benefits from doing the degree. Thinks the degree will provide him with better prospects in the future. This student is fully committed to a managerial career in

building and is set in his goals. The student sees the degree has hard work. This student left school at 18 and went straight into building, but did a part-time day release course in HNC at the same time.

General Cognitive (intellectual, personal and professional development)

This student is more professional in his approach to working. This student has a realistic approach to working. This student can apply the academic to the real world situation. This student has an open-mind, but seeks evidence to support his arguments. Work reinforces maturity of thought. This student is at least multiplistic.

General Affective (attitude, personality, integration (social))

Social integration is good - student talks to others about work mostly. Works part-time and has done so for eight years.

Background Academic (pre-university education, work experience)

This student lives in Cardiff with his parents.

Background Personal (age, sex, ethic origin, residence as a student).

Critical Points: No - definitely not. This student thinks this type of decision would be stupid - once a decision is made he sticks to it no matter what.

Case Study Five

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Enjoys working as a team on joint projects. This student thinks his ability to research a subject has improved greatly in two years. Assignments demand a lot of research. Has no problems with mathematics. Thinks maths is logical and progressive and success in it depends upon the way it is taught. This student prepared himself prior to coming to university in mathematics - did a GNVQ in general mathematics. This student needs to understand a concept before it can be learnt. This student believes individuals grasp things at different speeds.

Professional Affective (motivation, integration (academic & intellectual), commitment)

Motivation is (1) personal - I can do a degree and (2) the student started to believe in himself and now believes he can improve his ability to do the job which in turn will improve his job prospects in the future. He has noticed a marked increase in personal self-confidence in the two years. The student is committed to getting a job and is well organised. Quality of work - too much depends on how the course is planned. It could be planned by the school a lot better (ie student handbooks were sent out late).

General Cognitive (intellectual, personal and professional development)

Since going back to university/study this student has developed a different outlook. The ONC was very easy and it fits well with the degree programme.

General Affective (attitude, personality, integration (social))

Background Academic (pre-university education, work experience)

ONC in construction recent qualification. 20 years ago this student did a City and Guilds in plumbing and an ONC in heating ventilation (services)

Background Personal (age, sex, ethic origin, residence as a student).

Lives in Barry. Did ONC at Barry in Mechanical services sees the building degree as a natural progression

Critical Points: This student has never thought of giving up. His reasons for doing the degree are very personal and intrinsic. The student thinks that to give up would be a waste of time.

Case Study Six

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

The student has no problems with building numeracy or mathematics. In addition, the student found that Contract administration was very easy and this was attributed to his previous academic experience. The student finds there is a lot of work involved with the degree. This has got heavier in Semester B in Level Two. With two intensive projects done back to back. This student prefers Semesterisation because it splits up the exams.

Professional Affective (motivation, integration (academic & intellectual), commitment)

This student is doing the degree to improve his chances of getting work - to survive. Knowledge is needed for use in the working environment and there have been significant changes in the building industry in recent years so a higher qualification is a necessity. The changes in building include: wider use of computers and in general more managerial problems (health and safety). This student feels committed and well suited to this type of work.

General Cognitive (intellectual, personal and professional development)

This student's self-confidence has grown in recent years and he feels this has been a natural progression in development

General Affective (attitude, personality, integration (social))

This student regularly talks to other students on the course

Background Academic (pre-university education, work experience)

Background Personal (age, sex, ethic origin, residence as a student).

This student has always lived in Cardiff

Critical Points: This student is self-motivated and has never thought of giving up.

Case Study Seven

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

This student has a natural ability for mathematics. If he has a problems he finds someone (a student) to help. The student finds group work too community based and finds that some people do not pull their weight.

Professional Affective (motivation, integration (academic & intellectual), commitment)

This is this student's third attempt at a career. He sees it more as a personal challenge and was unemployed at entry. He also doubted his ability to earn more money because of the degree at graduation. Money is not the prime motivating factor, but this comes with maturity.

General Cognitive (intellectual, personal and professional development)

The student finds that the degree reinforces experience - the student has has 10 years work experience in building. This student finds academic life challenging and sees it as a game - how to play the game is the technique which really needs to be learnt

General Affective (attitude, personality, integration (social))

This student prefers to work alone and hates group work. Group work doesn't work

Background Academic (pre-university education, work experience)
Entered the degree in year 2 and has previous work experience in the building industry

Case Study Eight

Professional Affective (motivation, integration (academic & intellectual), commitment)
This student is very committed and likes to see things through (ie would never give it up). Money is this students prime motivator and his family is already in the business. This student likes to work alone and has no opportunity to work in a group at the university

General Cognitive (intellectual, personal and professional development)

General Affective (attitude, personality, integration (social))

Background Academic (pre-university education, work experience)
The student pointed out that the degree was only timetabled in level two on two days a week - a part-time, full-time course! This student did A Levels and a HND. This allowed him entry into year two of the degree. The student states that there is no incentive to work in level two with no exams in Semester B. This student has been warned that Level Four is very hard.

Background Personal (age, sex, ethic origin, residence as a student).
This students lives in Cheltenham, but travels in just for the two days. This student wanted to go to University of the West of England University in Bristol, but they do not do a degree in building with honours. However, the building degree at UoG has a good reputation

Critical Points: No. Failure is not an option. This student cannot tolerate losers.

Case Study Nine

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
This student has discovered that personal initiative is important, especially when doing group work

Professional Affective (motivation, integration (academic & intellectual), commitment)
The student seeks future security and a good job as a result of doing the degree

General Cognitive (intellectual, personal and professional development)
This student studied to HND level and then travelled for a year before doing a degree. This was because he had the opportunity to go abroad. In terms of intellectual development, this student mixes well with all walks of life and sees this as a factor in promoting intellectual development. This student thinks that the outside world (outside the university) is a very important factor in promoting development

General Affective (attitude, personality, integration (socially)

Background Academic (pre-university education, work experience)
Did an ONC in construction and then a HND

Background Personal (age, sex, ethic origin, residence as a student)
Lives in Cardiff

Critical Points: No it is my nature to stick at things whatever

Level Four 1995-96

Case Study One

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
struggled with the structures and mathematics
Extrinsically motivated
average performance profile slight decline in performance at the final level.

General Cognitive (intellectual, personal and professional development),
Feels lack of intellectual personal due to living at home.

General Affective (attitude, personality, integration (social))
Lives a home, limited social interaction.

Background Academic (pre-university education, work experience)
This student entered onto the degree via a HND course during Level Two of the degree programme.

Background Personal (age, sex, ethic origin, residence as a student).
18 years of age, male, lives at home in South Wales.

Critical Points: During the HND the student did the 1st year then did a year out before doing the final year because he nearly gave up. This student also really wanted to do a degree in Quantity Surveying - second choice, last minute decision to do degree in Building Technology and Management - but changed mind. For the degree in building the student thought of giving up two weeks before Christmas (Semester A - Final Year) due to too much work and too much pressure. However, the Denmark trip (break from course) gave the student better motivation, due to a more relaxed atmosphere experienced by students abroad (positive critical point).

Case Study Two

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Approaches to Studying: This student has a meaning orientation.

Professional Affective (motivation, integration (academic & intellectual), commitment)
High achievement motivation. Integration: Works mostly alone, but interacts with at least 40 others on course. Due to a high examination result student is also academically integrated. Career aspirations and commitment: This student has worked (in the building industry) for himself before, but now seeks advanced qualification in order to work for others.

General Cognitive (intellectual, personal and professional development)
Intellectual development: This mature student actually believes that entering a degree course later in life can disturb development .."development is actually mucked up." This student also noted that lectures were not structured well and individual course elements do not inter link. This student is at the multiplistic stage of Perry's development scheme.

General Affective (attitude, personality, integration (social)
Fully socially integrated.

Background Academic (pre-university education, work experience)
This student entered onto the degree programme during the final year. This student entered the course with 2 A levels - but in unrelated subjects. This student has previous building experience and his own company. With work experience - site management very little science/technology.

Background Personal (age, sex, ethic origin, residence as a student).
He is a mature student (40 years 3 months). Residential: Married - own accommodation

Critical Points:
Worried too much during the first stages of the year. Self-reported lack of confidence during the first few weeks. This student is married with 2 children - family pressures interfere with work.

Case Study Three

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Approaches to Studying: This student scored high on a reproductive and strategic orientation and surface approach to studying.

Professional Affective (motivation, integration (academic & intellectual), commitment)
In terms of motivation, this student is extrinsically motivated. Integration: Academic integration a little disjointed due to little explanation of what is required by the lecturer. This student also finds it difficult to understand what is required for some lecturers. The student also does not understand the pitch and standard of work required. Career aspirations and commitment: This student wants a career change - and wants to direct work not to be the worker! ie. seeks a managerial role.

General Cognitive (intellectual, personal and professional development)
Intellectual development: This student scored high on the committed stage of Perry's scheme. This student believes she has a higher level and a more mature mental/intellectual processing. The student is more prepared to question and argue with staff . The student would like more dialogue with staff - face to face lectures difficult to cope with. This student also noted that the younger student accept information without question (an indication of dualistic/concrete operations?). The student also felt that the younger students expected to be told what to think, what to do.

Background Academic (pre-university education, work experience)
This student entered onto the degree programme during the final year after HND. In Semester A this student scored 11.4. Mature student with extensive of work experience.

Background Personal (age, sex, ethic origin, residence as a student).
This is a female mature student age 40 years 3 months at entry to the degree programme. Financial Problems: High personal debt, before becoming a student! What is debt?

Critical Points
At the beginning she was fearful of competing with other younger students, but this has passed. This student did have a problem in the beginning - more to do with a lack of confidence in her own ability. This student has felt many times that she is too old to be doing a degree and has too many personal/family commitments and that the student lifestyle is incompatible with her own.

Case Study Four

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Approaches to Studying: This student is largely a surface learner. His main orientation to studying is meaning and strategic.

Professional Affective (motivation, integration (academic & intellectual), commitment)
In terms of general motivation, he is intrinsically motivated. Integration: This student is very socially integrated - plays rugby and has joined many university clubs. Academically, he finds the assessments a bit vague and the overall achievement or purpose of the course is undefined. This student will discuss

work with friends (2 mates), but mostly works alone. Career aspirations and commitment: This student fears that jobs are in short supply and that good qualifications are essential. Where this student isn't particularly gifted, his examination performance has been reasonably good, if not stable.

General Cognitive (intellectual, personal and professional development)

Intellectual development: This student is multiplistic in terms of intellectual development. He believes he has become more confident and more professional in approach to studying and building in general. He also considers and thinks about things a lot more.

Background Academic (pre-university education, work experience)

This student entered the course at Level One with a BTEC in construction from Bath. Performance profile is stable

Performance profile: 9.5, 4.3, 4.8, 4.1,9.8 = 4.92

Background Personal (age, sex, ethic origin, residence as a student)

This student is a 21 year old mature student. This student is supported by family and has no problems with money.

Critical Points:

There haven't been any. Performance profile is also very stable .

Case Study Five

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Professional Affective (motivation, integration (academic & intellectual), commitment)

Integration: Academically, assessment requirements are a little vague and it is difficult to know what is expected. This student notes that lectures are boring, are lumped together eg. 4 hours worth back to back. (more breaks, shorter lectures?). Career aspirations and commitment: This student is unsure about the future and of what career to follow.

General Cognitive (intellectual, personal and professional development)

This student's academic profile is on the decline. Semester B at Level 2 being the lowest point - exam pressure.

Background Personal (age, sex, ethic origin, residence as a student).

18 year old student who entered the course with a BTEC in construction. Notes BTEC is a good foundation for the degree in building.

Performance profile 10.2,10.3,9.5,4.2,4.0,9.0 = 4.7 (2ii)
Note a decline in performance in Semester B, Level Two.
Residential: This student lives at home - 30 miles away.
Works at home 2 days a week, but feels he needs the discipline of working at the university.

Critical Points:

No critical points identified, but the student noted that pressure does mount near exam time and he has thought of giving up at this time.

Case Study Six

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Approaches to Studying: deep approach, meaning and strategic orientation to work.
"the maths side of the course is taught too fast".

Professional Affective (motivation, integration (academic & intellectual), commitment)

high intrinsic and achievement score for motivation, but a low extrinsic motivation.
Integration: Student admits his performance and attitude wasn't very good in Level One and Two, but he is trying harder now. He put this down to an immature approach and problems with staff.
Commitment/motivation: Family is in Civil Engineering, but student finds this too mathematical so prefers building.

General Cognitive (intellectual, personal and professional development)

Intellectual development: high commitment to knowledge
The student has noticed a gradual change in development since Level One and is now more applied and responsible.

General Affective (attitude, personality, integration (social))

too much social interaction in Level One and not enough work done.

Background Academic (pre-university education, work experience)

This student entered the degree programme at Level One with a BTEC in construction

Performance profile 4.6,4.3,4.4,9.0,4.5 = 4.5 notes a steady increase in achievement.

Background Personal (age, sex, ethic origin, residence as a student)

This student is 19 years old.
Lives in Cardiff - father's property,
PT job for money, two days a week this student works - and father helps to find work to support myself.

Critical Points:

End of Level One - failed one subject. Re-sat and failed again.

Assessment:

This student is improving academically.
self-motivation and self-desire to work and learn.
His initial problems with the course seem to be due to a lack of self-discipline and immaturity.

Case Study Seven

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Approaches to Studying: reproducing/strategic orientation to work - high score for surface approach to studying.

Professional Affective (motivation, integration (academic), commitment)

low intrinsic motivation and a high achievement motivation.
Integration: Academic integration academic standards differ between lecturers.
Commitment/motivation: Family is in building.

General Cognitive (intellectual, personal and professional development)

Intellectual development: very high dualistic/multiplistic score

General Affective (attitude, personality, integration (social))

Background Academic (pre-university education, work experience) Student entered with a certificate in BTEC construction in Level One.
Work placement provides a value-added element the student/course and prepares the student for Level 4.

Background Personal (age, sex, ethic origin, residence as a student).

Critical Points:

Student has thought about giving up many times and can identify cycles of depression and academic stress. = lack of money, too much work and the continual comparing of self with others outside the university who are working and earning money.

Case Study Eight

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Overseas educated until A Levels (18 years), high meaning orientation, deep approach to studying.

Professional Affective (motivation, integration (academic & intellectual), commitment)

Commitment/motivation: achievement motivation is high.
Integration: studied every night - but lost interest - know most of it already - not challenging enough. studies alone except for group/project work.
Assessments - not explained well - changes every month, confusing and difficult to understand questions, but not true for all modules.
Academic difficulties: Resit in 1994 - soil mechanics and design - extra module = overloaded. Entered with a HND Civil Engineering - admin problem - failed to get entry onto Civil Engineering degree which was really first choice.
Commitment/motivation: extrinsic - career as a Project Manager

General Cognitive (intellectual, personal and professional development)

multiplistic in terms of Perry's development scheme. This student has noted and increase in personal confidence and the development of argument based reasoning.

Background Academic (pre-university education, work experience)

This student was educated overseas until A Levels (18 years). He entered onto the course with a HND and A Level background (maths)

Critical Points:

After finishing the HND in (Civil Engineering) this student thought of giving up study in HE. Eventual entry onto the 'wrong' degree - the Building degree may have reduced this student's potential to do well academically in HE

Assessment:

This student could have been on the wrong course right from the beginning. His first choice was a degree in Civil Engineering, not building. However, he did get an offer of a very good job on graduation.

Case Study Nine

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Approaches to Studying: High meaning orientation - High strategic approach to studying

Professional Affective (motivation, integration (academic & intellectual), commitment)

This student has a high achievement motivation.
Integration: This student discusses in groups (self formed) with friends on course (3 of) like minded. Student remembers feeling isolated and lonely in level 1 - resistance low, but very supportive girlfriend kept him going.
Expectations: This student's expectations of the course have been met - level 1 very easy, but the big jump from Level 2 to 4 throws most people.
Placement year - lost sharpness in studying - advantage (puts course into context with reality) - disadvantage (lot harder to come back to). This student found that placement work helps level 4 work.
Career aspirations and commitment: This student is very self motivated. This student finds the workload at Level 4 very high but very self-motivating. This is very different from yr. 1 were it was very easy - no challenge. This student wanted to go to Edinburgh, but chose UofG after getting low exam results. This student wants a career in construction management.

General Cognitive (intellectual, personal and professional development)

Intellectual development: This student has seen an increase in confidence from Yr. 1 to Yr. 4. This student is multiplistic in thinking now - broaden the mind. This student is very aware of the world outside building. This student has a holistic approach to work, but pieces did not not come together until final year.

Background Academic (pre-university education, work experience)

This student entered the course via the BTEC route in Building Studies.

Background Personal (age, sex, ethic origin, residence as a student).

Critical Points:

At no point has this student thought of giving up the course - the hard point is now Semester A in level 4.

Case Study Ten

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Approaches to Studying: this student is a self-confessed deep learner, but scored higher on the surface approach to studying questionnaire. This student is strategic in orientation.

Professional Affective (motivation, integration (academic & intellectual), commitment)

This student is extrincally motivated.
Career aspirations and commitment: This student works regularly from 9pm onwards each night - a lot of pressure to do well. This student wants career in management.

General Cognitive (intellectual, personal and professional development)

Intellectual development: This student thinks logically now - final year draws own conclusions, analytical, argument, questions things more, less science more management.

General Affective (attitude, personality, integration (social))

Integration: This student discusses work first with others then does the work alone - revises with others.

Background Academic (pre-university education, work experience)

This student entered the course via the HND in building studies.

Background Personal (age, sex, ethic origin, residence as a student).

Critical Points:
This student felt that the first semester A at Level One was the worst time (academic reasons), but stuck to it because a degree leads to a better job in the long run.

Assessment:
This student thought of giving the course up in the first semester in level one.

Case Study Eleven

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Approaches to Studying: Meaning orientation to work. Surface approach to studying. Extrinsically motivated.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Integration: This student studies alone - except for project work, but discusses work with other students or lecturers if needs help or clarification. Welsh Speaker - English weak, but now much improved. He feels this effects his understanding of what is required - questions in exams can be too complex.
Career aspirations and commitment: This student studies for at least two hours per day but this is always concentrated time. Extrinsically motivated - friends doing degrees - natural progression from further education to higher education. However, this student in now unsure as to what career to follow - maybe teaching (post grad) not 100% sure whether to stay in building - found this out on placement.

General Cognitive (intellectual, personal and professional development)
Intellectual development: Multiplistic in terms of intellectual development. No comment made on this in the interview.
Student is Welsh - speaking (North Wales) finds exams difficult - slight disadvantage to other students.
Residence: Halls in Level One, out in Year Two and in Halls in Level 4 - quiet in Glamorgan Court.

Critical Points:
Stable - harder in level 4 - not getting right rewards - marking is harder.
Wouldn't give up, but doubts made the right degree choice. Level 2 - too theoretical not practical enough.

Case Study Twelve

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)
Approaches to Studying: career orientated, very mature attitude to studying and work. This is a product of his culture, High meaning orientation to working. This student cannot understand some questions in examinations because of complicated English. Dictionaries are not allowed!

Professional Affective (motivation, integration (academic & intellectual), commitment)
Academic integration - close to exams works as any hours a day as possible, but not at weekends.
Career aspirations and commitment: Overseas culture - private building firm (family run) country's Civil Engineering not stable - alternative job maybe required outside own country. This student thinks a degree essential - very important - parents paying (privately funded).

General Cognitive (intellectual, personal and professional development)
Intellectual development: Highly dualistic and very Committed. A score quite common in foreign students.

General Affective (attitude, personality, integration (social))
Integration: National - wind surfer - social life in Cardiff - car sports. Finds it difficult to integrate

with other students owing to differences in culture/social class.

Critical Points:

Degree is very important - would never give it up.
Cultural difference - Turks solve problems don't run away from them. Independent person - lives alone - solves life problems well - self-reliant.

Observations:

This student has problems with drawing. He also thinks that the surveying element - needs to be taught better. This student thinks that experience of construction industry is necessary to complete the course - relevant content. This student is fluent in spoken English.

Case Study Thirteen

Professional Affective (motivation, integration (academic & intellectual), commitment)Integration:

Student works for 5 to 10 hours a week.
Student works in pairs for discussion.
Expectations: A bit in the dark - little or no explanation of what could be expected.
Career aspirations and commitment: The student's family is in construction - ex and intrinsic motivation. The university has a good reputation in Cornwall.

General Cognitive (intellectual, personal and professional development)

Intellectual development: No change noticed - same as sixth form.

General Affective (attitude, personality, integration (social))

Socially, this student is involved in sport - gym - rugby - always done it!
Academically - the student thought the 1st year required a low standard of work.

Background Academic (pre-university education, work experience)

This student has entered the course via the HND route - taken at University of Glamorgan. Before this he did A Levels (Maths & Physics).

Case Study Fourteen

Professional Cognitive (awareness of skills, mathematical ability, approaches to studying)

Approaches to Studying: surface learner.

Professional Affective (motivation, integration (academic), commitment)

Integration: No regular work pattern - workload dependent - and time of year on my own - find it easier. Works in a self organised group - knew each other beforehand.
Career aspirations and commitment: A degree provides better prospects, better job. Student's family is in construction - with own business.

General Cognitive (intellectual, personal and professional development)

Intellectual development: Student is more methodological - more focused in work. Intellectual development just happened - no placement between year 2 and 4.

General Affective (attitude, personality, integration (social))

Expectations: Irish background, but settled in with Irish friends, no preferential treatment (overseas)

Critical Points:

Level One - Christmas - homesick end of Semester A (Feb). Student thinks you work harder in the winter. Student feels more confident in final year - exams motivating me to do well. It is the end

point of the degree - it is a very important time.

Observations:
Multidisciplinary course (did realise this before started). Notes that the course requires a lot of common sense.

Case Study Fifteen

Professional Cognitive constant deep learner (more mature?) in approach to studying.
Expectations: No preconceived ideas of course - no goal for studying, just the degree. Academic expectations have been justified - thought it would be hard and it is.

Professional Affective (motivation, integration (academic & intellectual), commitment)
Integration: Student works around 20 to 30 hours a week - but intensive working, studies on own, but discusses academic things with others.
Commitment/motivation: Extrinsic motivation - job security higher if better qualified. looking for better prospects - step wise promotion from manual work.

General Cognitive (intellectual, personal and professional development)
Intellectual development: Student is more critical of reality vs. theory in the course content, more confident, more methodical, thinks more, but it was a gradual process and recognised no definite developmental changes.

General Affective (attitude, personality, integration (social))
Socially he plays a lot of sport - badminton/canoeing.

Background Academic (pre-university education, work experience)
C&G and a trade route, student was very defensive about his academic background.

Background Personal (age, sex, ethic origin, residence as a student).
Residential: Lives at home in Llanelli.

Critical Points:
No science in final year - geared more to management. The course is well balanced in years 1&2, but less so in year 3. This student studies each module equally - and has experienced no particular problems with any.

4.10 Review of results - review of data

4.10.1 The factors that determine academic performance

Early studies (Thomas, Adams & Birchenough (1996); University of Wales - Institute Cardiff (1997) and HEFCE (1997)), seek to determine the actual factors behind non-completion of degree courses in Higher Education. The information gleaned from these studies has been coupled with information gained from this work. In addition, this study, in particular the one-to-one interviews, provided the study with several important factors that determine the level of academic performance in Higher Education and on the BSc Building Technology Management degree programme in particular.

From this it is hoped that a more penetrating analysis can be established to drawn on more information about why and when students leave. More importantly, this study opens up both the negative and positive factors that influence student performance.

4.10.2 Pre-entry qualifications

A significant finding from the research literature comes from an attempt to establish a relationship between pre-entry qualifications (A' Levels and BTEC) and subsequent academic performance at university. Results from this study indicate a poor correlation between pre-Higher Education and academic performance at Higher Education. This supports evidence by Sear (1984) that the pre-Higher Education qualification cannot be relied upon when selecting undergraduate candidates for places in Higher Education. However, at present it is the only quantifiable parameter which is referred to when determining an applicant's potential ability to pursue a course of study.

4.10.3 Mathematical Diagnostic Test

The mathematical diagnostic test was given to Level One students as an aptitude/skills test in numeracy. It was discovered that many students have specific problems with certain aspects of numeracy, but it did not provide an effective indicator of future performance. It was found that many students had study difficulties with algebra, trigonometry, logarithms and the use of equations and indices. The results of the test were analysed against subsequent examination scores taken from Semester A and B at Level One which provided a poor positive correlation between the test and relevant modules that use mathematics. However, it is likely that the additional support provided to numerically weak students would enhance their progress with the mathematics/scientific subjects.

4.10.4 Intellectual Development Inventory

Intellectual Development was studied via the use of a specially constructed inventory taken from the work by Erwin (1981 and 1983). As expected, the inventory produced a result similar to that first suggested by Perry (1970). Twenty-two Level One students took the test and the overall score placed a majority of them as "multiplistic" in their

thinking. Sixty-two Level Two students also took the test and produced a wider spread of results with a majority of the students being either "multiplistic" or "committed". Forty-nine students took the test in the Final Year (Level four) and again scored high in the "multiplistic" and "committed" stages of development.

From these results, little or no information has been gained as to "why" students underachieve or leave the course. It does however point towards the First Year (Level One) as being the most vulnerable time. Perry (1970), in his analysis, stated that "retreat" and "escape" occurs between the dualistic and multiplistic stages of development and the evidence here indicates that the First Year students (Level One) were at that stage.

4.10.5 Approaches to Studying Inventory

The original purpose of the ASI was to test three aspects of student study behaviour: approach, motivation and orientation, and its relationship to students thought to be "at risk" of failure. From the analysis it appears that there is no pattern in the data to support the idea that students with a certain approach, motivation or orientation will either do very well or very badly in terms of overall academic performance. The ASI therefore is not a good indicator or test of further academic performance.

4.10.6 Interviews

Fifteen in depth interviews were conducted in Semester B of 1995-6 from the final year or Level Four. They have been categorised according to the Cohen & Manion classification and will contribute to a large part of the next analysis which is to present a composite theoretical framework on the factors which determine academic performance and non-completion. The process of collecting interview data is difficult. In this case, there has been a shortage of time available in which to undertake the interview and, in some cases, a reluctance by the student body to take part in the interviews.

4.11 Review of analysis

4.11.1 The analysis

Sections from 4.1 to 4.8 analysed the data collected: pre-entry qualifications, mathematical diagnostic tests, levels of intellectual development, the students' approaches to studying and the information collected from individual interviews.

4.11.2 Review of categorisation of data

Sections 4.9 and 4.10 in particular, attempted to categorise the data collected in two stages, firstly by individual student and secondly by grouping students into categories or 'typologies'.

Chapter 5. The Development of a New Theoretical Model

Reasons for withdrawal or underachievement

5.1 Introduction: The search for a new theoretical framework

The project investigated the student experience of Higher Education with particular reference to changes in teaching and learning strategies experienced by the students as they pass from one level in tertiary education to a higher level. The investigation aimed to collect and interpret information and data on a number of factors that influence success or otherwise of a selected number of students studying at the University of Glamorgan. The ultimate objective therefore has been to identify 'at risk' and vulnerable students and to recommend strategies and changes to the degree programme that may assist them in meeting the transition between further education or work and higher education.

The aim of this chapter is to develop a theoretically informed investigation of the interaction of social, academic and personal factors that contribute to withdrawal, underachievement and referral in Higher Education. Chapter 4 initially set out a sample of individual student profiles based on a breakdown of data collected from various sources: background information, diagnostic tests, inventory test results and mostly interview data. This information will be further manipulated to present a clear student typology of students 'at risk', in the form of a simple risk assessment. Secondly, this chapter will set down a developmental or crisis model to illustrate academic performance and to identify the critical points of risk. This part of the study will consider two 'pathways' - completion and non-completion. This will involve a consideration of the life and academic crises (points times of 'fear' or difficulty) that control the decision making process which results in the student remaining on the course or leaving. This part of the research will track undergraduate movement from

one developmental stage to another.

The interpretation and explanation of the work carried out is the sole responsibility of the researcher. This task requires the researcher to develop a conceptual framework through which actions and events can be mapped out and explained clearly. The conceptual or theoretical framework presented in this work falls into two distinct framework sections: a developmental or staged model of academic performance and non-completion and a model of the student typology 'at risk' of underachievement, withdrawal or referral.

5.2. Introducing a new theoretical framework

5.2.1 Model (1) The Developmental or Staged Model of Crisis Points and Points of Deflection (i.e. withdrawal or underachievement)

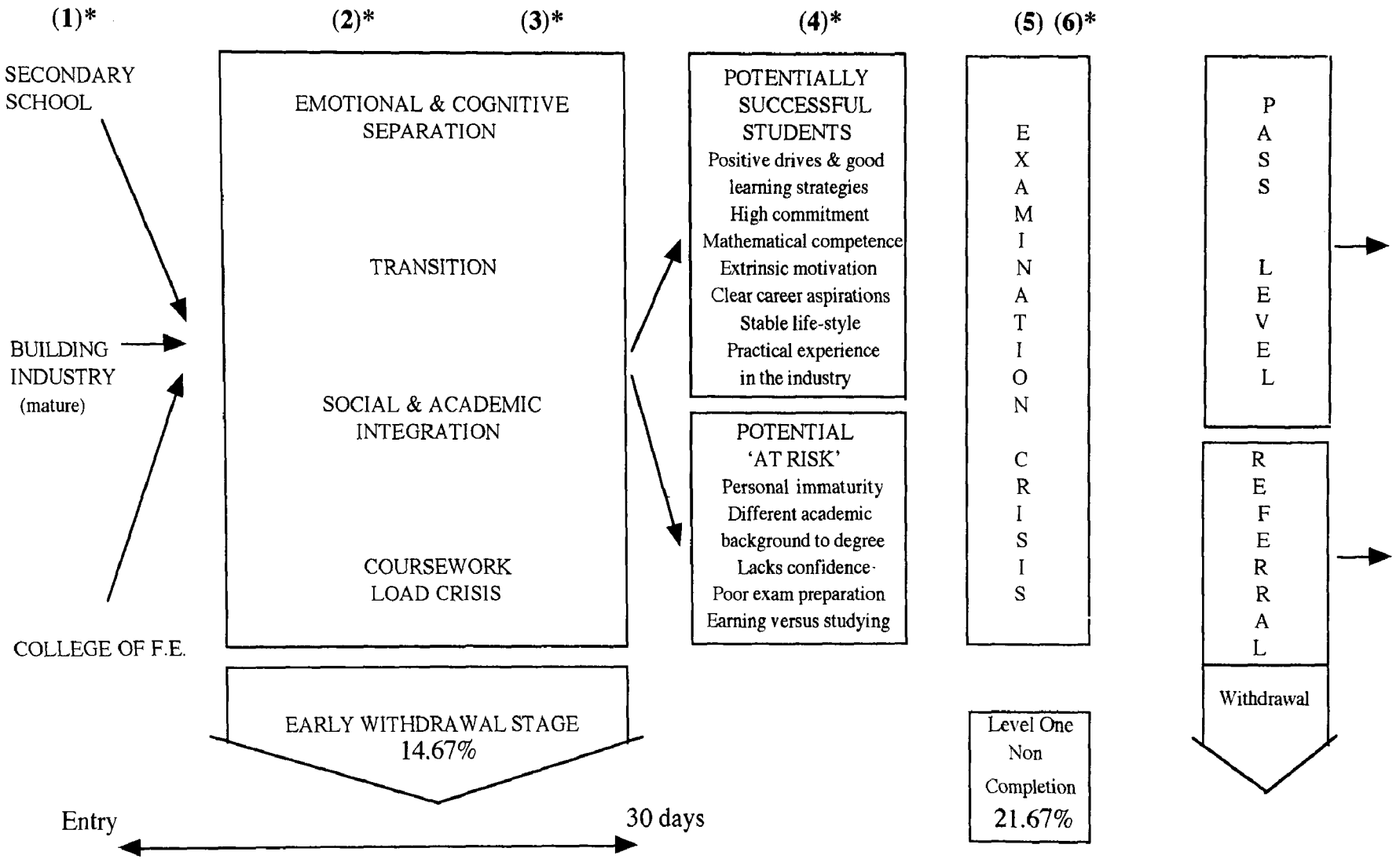
The construction of a multi-causal or eclectic model of academic performance (a study of progression and retention) has been achieved by the collection, manipulation and analysis of a wide range of information and data sources. This multi-causal or eclectic model of academic performance and study of progression and retention, begins by incorporating elements into the model taken from the work by Tinto (1988). The model (Figure 8) starts with Level One and the *enrolment and registration* phase. The model describes and explains this phase as a major psychological event and one which determines how well a student settles into the university as a whole.

This study primarily focuses on full-time students who enter the degree programme via three main routes: secondary level education (school and college of further education) and employment. This part of the model is very similar to the first stage in the Tinto (1975) model of student non-completion, but it intends to be a little more specific. This model draws on statistical data to quantify and therefore describe what type of individuals make up the student body on the degree programme at entry. In 1994 5.2% of the student's entering the degree programme did so via a traditional A' Level route. 83.3% entered with a BTEC qualification either in Building Studies or Construction.

Figure 8

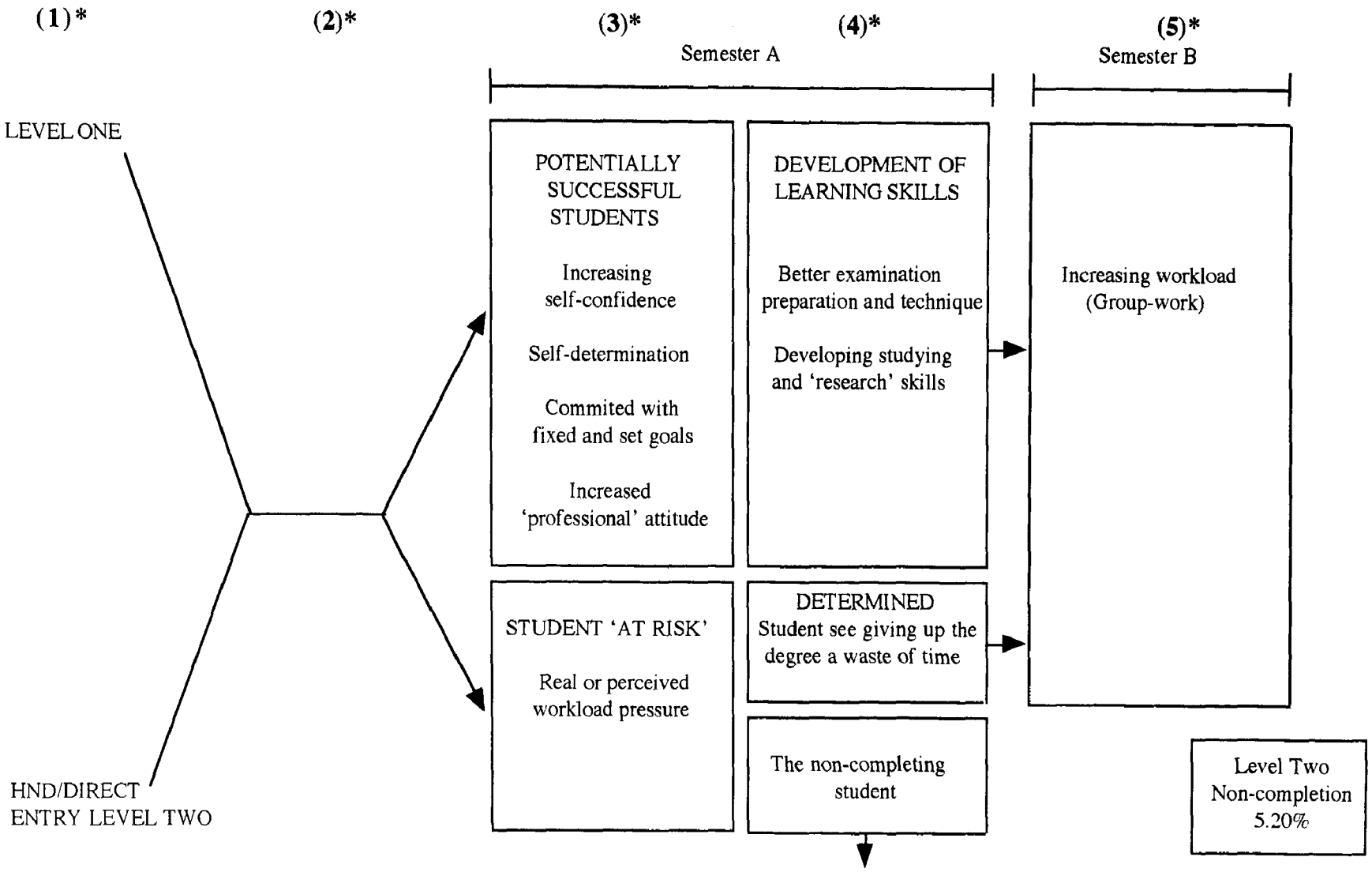
(1)* refers to text

Theoretical Framework - Level One (Semester A & B)

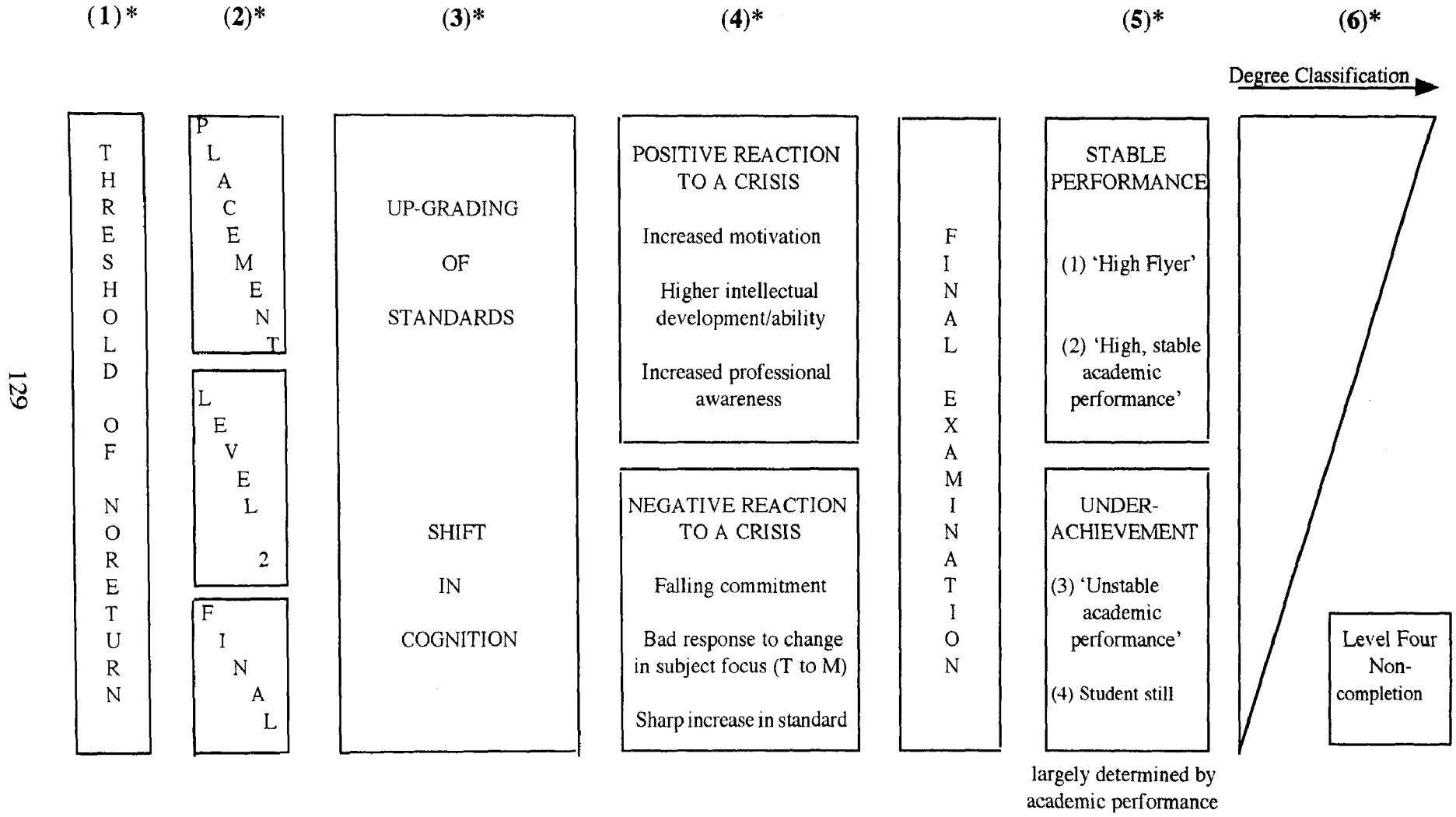


(1)* refers to text

Theoretical Framework - Level Two (Semester A & B)



Theoretical Framework - Level Four (Semester A & B)



However, by 1995 the numbers entering via the traditional route had levelled out to 41.9% coming from an A' Level background to 45.2% from a BTEC background. The age of students at entry has also seen a dramatic and immediate shift. The age of entrants from 1994 to 1995 shifted from 95.9% aged 18 to 21 in 1994 to 61.3% in 1995. By contrast, the numbers of non-traditional entrants rose from 4.1% in 1994 to 38.7% in 1995. The most interesting statistics, however, are found in the number of referrals for 1994/95 and 1995-6. In 1994/95 only 5.5% of the students in Level One had to be referred. By 1995/96, this number had risen to 22.6%.

Of significance at this point is how the student body varies from cohort to cohort. In this case, the shift in the students' academic backgrounds from BTEC to A Levels and the increase in the average age of the student at entry. This change can be accounted for and is partly determined by the external economic environment of the time. The building industry since the early 1990's has been in a period of recession. Consequently a degree in Building Technology and Management is no longer seen as a particularly desirable asset in the jobs market. The increase in mature or non-traditional entrants is also a result of changing circumstances. Students who enter after the age of 21 tend to be people with extensive experience of the construction industry, but not at the managerial level, and these people see the degree as an essential requirement for a career in middle or senior management.

The *departmental induction and academic and social integration* phase of the model is one which determines how successful a student is at integrating into the academic and social side of university life. This phase includes the main critical point or the main point of potential crisis or potential risk of drop-out. This phase therefore marks the point which is termed the *early withdrawal stage*. This phase continues for about a month after registration and it is at this point where the rate of non-completion is at its highest. The induction and academic and social integration phase incorporates three processes: SEPARATION, TRANSITION and INTEGRATION and this section of the model follows very much along the lines set out by Tinto (1988). All students follow the same path at this point once they have enrolled and registered into the degree programme, but once they begin the settle into the university, personal factors begin to

develop, which determine the student's level of satisfaction and initial commitment to the university and then the course. It is at this point where the student's first impressions of the university and the department or school begin to count. Students who withdraw at this point from the degree programme tend to be those who are dissatisfied with the university and its environment or with their living conditions.

The next phase in the model is the SETTLING-IN or WORKLOAD phase. This is the first academic crisis point. At this point, the students begin to get an idea of what is required from them in terms of attendance, commitment and interest. This is a critical phase and one which determines the real level of a student's commitment to the course and indirectly a career in building management. Students who withdraw early, do so at this point. After this point the 'pathway' divides into two tracks: a positive track of further development and unseen achievement and a negative track where the student becomes academically 'at risk' of underachieving and withdrawal. The two 'pathways' are marked in very distinct ways. The positive track or pathway includes the positive drive and adoption of positive strategies for working and learning. This includes: a willingness to conduct independent studying and research, a high level of commitment to the degree programme, relevant and practical work experience and more importantly a willingness to change to and develop new study skills and learning strategies in response to a changing educational culture in Higher Education. Finally, a stable personal and good home life is very important for overall stability (many students at the University of Glamorgan live locally and/or have a family home in South Wales).

Alternatively, the negative pathway indicates a poor level of commitment to the degree programme, problems in coping with both the practical and theoretical aspects of the degree programme and no clear career aspirations, poor study skills, poor student to course match, poor examination preparation and technique, a general lack of self-confidence in examinations (i.e. inexperience, nervousness and mental blocks) and a different printer academic background from the norm (i.e. in 1995-96 there has been a significant increase in the number of students coming onto to the degree programme possessing A' Level subjects from the field of the Humanities from subject areas such as: Psychology, Welsh and History). This increase is in response to a changing

attitude towards Higher Education by some students who prefer to study on a degree programme which has a strong vocational base.

The final crisis or critical point in Semester A is the examination period after the Christmas period. It is important to distinguish between what is meant in this thesis by the terms' 'critical point' and 'potential points of crisis'. A critical point is the actual known event (at the individual student level) where negative or positive factors or occurrences determine either a successful or unsuccessful, or enjoyable or unenjoyable learning experience. The point of potential crisis is an academically and degree programme, determined point of potential risk. In essence, all students (and all learners) follow a critical path of events which mark out a sequence of stages in learning. For learning and intellectual development to occur, the student must be taken through a process which brings about change in the way they work, think and learn. However, this process (or degree programme) must be carefully planned in order to eliminate as many potential crisis points that are seen as unnecessary to learning and intellectual development. By doing so, the institution removes the potential for later withdrawal or referral. It is therefore suggested that careful degree programme planning not only enhances student performance, but it could also have an impact upon reducing student wastage. The Semesterisation system increases the time spent on the traditional examination and therefore increases or doubles the potential amount of stress to the student. The use of examinations at the end of all six semesters also increases the workloads for both students and lecturing staff. If this time could be freed up, this would result in better pastoral care and the development of knowledge and skills which may be better tested and examined through alternative methods.

In Level Two, the non-completion rate begins to slow down quite dramatically. The potentially successful student possesses an increasing self-confidence, self-determination, commitment with fixed personal and professional goals and an increased 'professional' attitude to working. The successful student attributes this to the successful development of study skills, 'research' skills base, examination preparation and examination technique. Alternatively, the student 'at risk' finds the workload difficult to cope with. This student can react to this in two ways: (i) by feeling defeated

or (ii) being determined to continue. The student who is determined to continue does so because he/she believes that giving-up the degree would be a waste of time committed to date. At this point, the student has achieved a high level of commitment to the degree programme. This is further reinforced as the student returns for the final year.

At the start of Level Four, a 'critical threshold of no-return' has been identified between the end of Level Three (the placement year if a sandwich course is in operation) and the beginning of Level Four. At this point the student is unlikely to withdraw, but this is not necessarily a certainty. However, once Semester A in Level Four (Final Year) has started, the first critical point of the semester is identified and this is the problem of disorientation faced by the students who are on the sandwich course as they return back from industrial placement and have to readjust to academic life for the last time. A point to note here, is that a small number of students enter the degree programme directly in Level Four for the first time and these students are often well-experienced and mature people enrolling directly from the construction industry. These students, even though they possess great practical knowledge and skill, expressed personal reservations such as a lack of self-confidence in their academic ability to complete the degree programme. Family responsibilities and commitments, and uncertainty about the quality and appropriateness of their study skills were additional factors of concern.

At this point, it is rare for a student to withdraw. However, two 'pathways' of achievement have been identified - negative and positive. Positive crises include: increased, and the firming up of, commitment to the degree programme and to a particular career, increased personal maturity (personal, social and intellectual) and an increase in general motivation to achieve the best degree classification possible. Negative crisis points include: falling commitment to the degree programme and a decline in interest, problems readjusting to educational change. There is a sharp increase in the standard in Level Four and there is also a change in emphasis with more management and less science and technology in Level Four. The final critical point or point of crisis, naturally, is the final session of examinations in June.

The aim of this section of the model has been to describe the idea of a 'crisis' or 'critical' incident point within the development process. As with life in general, as each personal crisis point is faced, decisions are made and the appropriate action is taken. This is a decisive point in any learning process which is usually a time of great difficulty, but which is overcome through the application of intelligent thought and action. All learning is therefore reliant on both positive and negative critical points. However, in Higher Education, student learning is naturally more independent from direct tuition and more dependent on the individual student's perception, ability, commitment and motivation. The outcome of each learning crisis and on the action taken by the student (the resultant academic achievement and intellectual development) can also be either positive or negative or in some cases not even experienced or noticed by the student. The degree programme therefore is seen as a 'critical path' of events - a prescribed sequence of events, stages and levels in learning, progression and intellectual development. The argument here relates to the level of importance of the structure and the type of learning demands of the degree programme in promoting or demoting successful student learning. (i.e. what determines successful student progression and retention?). This thesis seeks to verify the importance of degree module and holistic degree course planning in the promotion of successful student learning and therefore as an indirect control of the level of non-completion. From the actual content of what is taught through to the actual step-by-step progression and process by which it is taught. A degree programme should be progressive, not only in terms of how it develops intellectual critical thinking, but also in the way it uses assessment methods to encourage the right type of studying and learning at the right time.

5.2.2 Model (2) The student type academically "at risk"

The second and subsidiary part of the theoretical framework seeks to break the problem down to an individual student level identification of the type of student academically 'at risk'. This part of the theoretical framework relies on the development of three successful student typologies and one 'at risk' category. The data for this part of the framework was largely extracted from individual student case studies or student profiles. The categories are as follows:

(a) The 'at risk' Student

The major contributory factors that were apparent from the data that could result in a student being 'at risk' are largely focused around psychological factors, namely: motivation, no clear career aspirations, little commitment to a short-term academic goal and/or longer term career goal, course work stress (the student is spending too much time in proportion to what the assessment is worth), workload stress - or a general lack of confidence, an alternative academic background or interest unrelated to building (i.e. psychology, history), a low level of personal maturity/personality clashes with students and staff (although this is a minor problem), general study skills problems (poor examination preparation and technique), specific study skills problems (mathematical/numerical incompetence), minimal private study undertaken (but this mainly applies to Level One) and the need to earn money outside the university.

These factors are more apparent in Level One where 'at risk' factors are more of a problem and the potential for withdrawal is the highest. It is generally accepted that a complex interaction or combination of factors results in student underachievement and in the student deciding to leave. The student 'at risk' of doing so is faced with many factors which, if in different arrangements, may tilt the balance and result in a decision to give up and leave the institution or to transfer to another course in the same or alternative institution. The total number of factors extends much further than those collected in this survey. However, it is argued that these factors are more prevalent for this research survey and a more precise reflection of the type of students attracted to studying Building Technology and Management.

(b) The Successful, Average, but Erratic Performer

The first of the 'successful' categories is the student whose performance is around the average, but is unstable, producing a slightly erratic performance profile (i.e. some modules obviously present a problem to that student more than others). For students who fall into this category, the following examples of why students experience difficulties have been gathered as a result of individual interviews, matched with academic performance profiles:

For example, limited effort to studying independently - this, of course, is partly the student's choice, extrinsically motivated, the student lacks intellectual development, the student finds assessments too vague, lectures boring, difficulties in concentrating, the student studies only at examination time, is unhappy with the way and speed at which the mathematics component of the course is taught, is more likely to re-sit examinations, and tends to be a surface learner.

(c) The Successful, Average, but Stable Performer

The third category of the 'successful' categories is the student whose performance is around the average (i.e. I and 2II), but it is stable. For students who fall into this category, the following examples have been identified: mature students tend to do better (Level Two or final year entrant), the student more likely entered via the HOD in Building route, the student has practical experience of the building industry, the student finds the assessments too vague, the student has fixed career aspirations in the building industry, the student is committed to the degree programme, the student has strong personal support and encouragement from friends and relatives and generally has a background at least in Building Studies or Construction (BTEC).

(d) The 'High Flyer'

The fourth category of 'successful' students is the 'High Flyer' or the student whose academic performance is or has been constantly stable and at the high level (i.e. a First or 2I). For students who fall into this category, the following examples have been identified: the student is confident in every aspect - academic and personal, the student has a good and confident examination technique, the student is more likely to possess a high Meaning Orientation and/or a high Achievement Orientation, the expectations of the degree programme have been met in the eyes of the student, the student is committed to a career in building and has a keen interest in the course and future career.

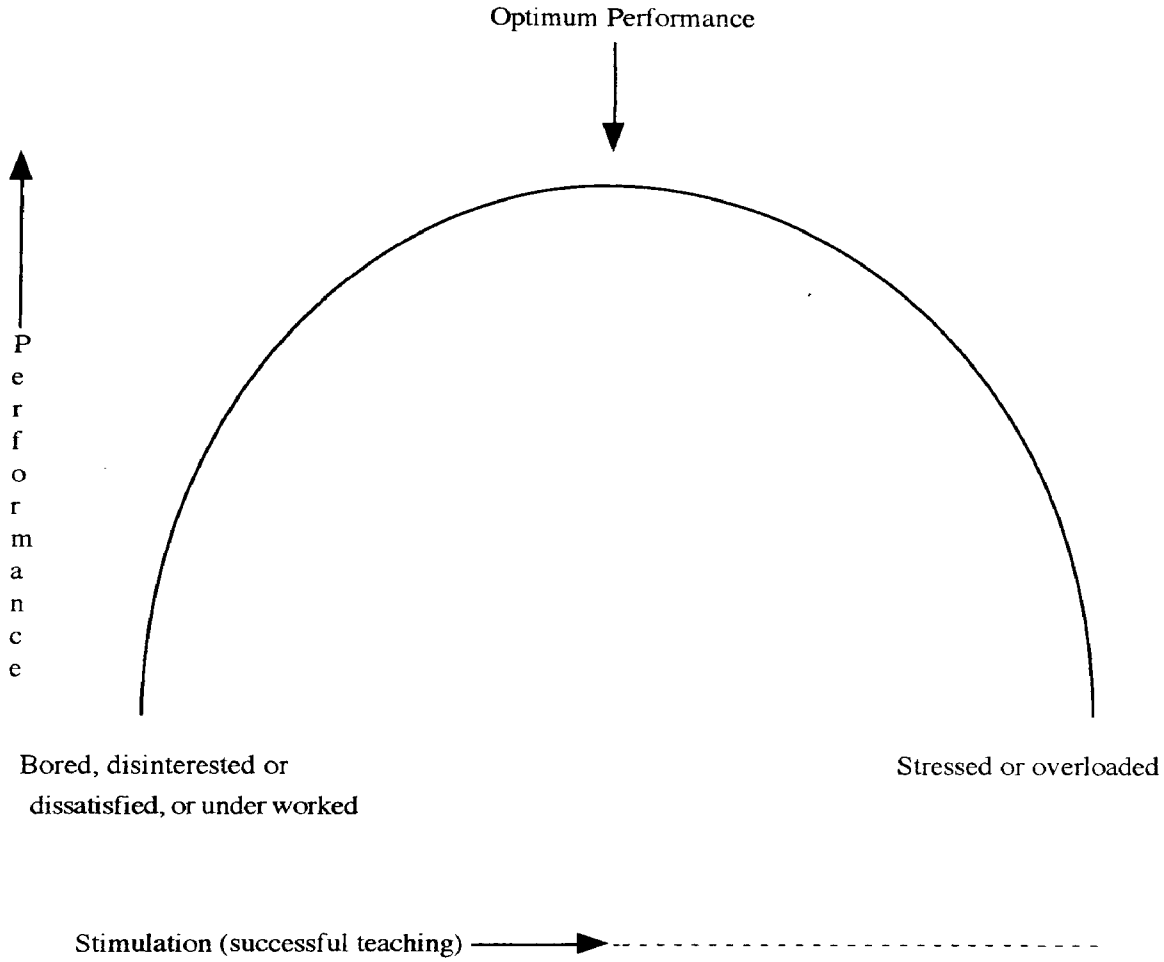
5 .2.3 Model (3) The Inverted - U Model

The theoretical framework presented here consists of three composite models: Model (1) the Developmental Model successfully sought to identify the critical points and the main processes students go through as they develop and progress through a degree

programme or depart for whatever reason.

Figure 9

Model (3) The Inverted U Model



This model represents the 'when' and 'how' of the progression and retention process. Model (2) the Typology Model sought to focus on the 'who' aspect of the problem - who is academically 'at risk'. This model - Model (3) The Inverted - U Model has been

taken from classical psychology and has been developed to explain 'why' students may be underachieving or leaving the degree programme in greater detail than the preceding models in the framework. This model, however, cannot explain why all students experience difficulty at university, but it does aim to inform the teaching of the degree programme. The Inverted - U Model has been adapted from a traditional model based on the relationships between performance and stimulation or arousal. This model extends further than the traditional model in the way it incorporates ideas about anxiety, motivation, study behaviour, surface and deep learning and locus of control.

Anxiety, motivation and a locus of control

Classical psychology describes the relationship between anxiety and academic performance in terms of an inverted U shape. Too little anxiety - the first side of the U brings about apathy and this is accompanied by too little motivation, while too much anxiety - the other side of the U - sabotages any attempt by the student to do well. (Hebb, 1972; Goleman, 1996). On a very basic level, anxiety damages mental performance of all kinds, too much anxiety undermines the intellect and can damage intellectual and therefore academic performance. To succeed, the student needs to be highly motivated and committed to studying for a degree and be capable of withstanding any problems (private or academic) that present themselves during the course of the degree programme.

The Inverted U Model

This existing theory has been utilised to create a new model to describe and explain the relationship between learning anxiety and motivation in the Higher Education context. Naturally, the structure of this model is in two parts comprising: anxiety and motivation. Anxiety is predominately a negative state of mind, but motivation can be either negative or positive. A third dimension has been added to the equation and this the locus of control. An individual's locus of control determines motivation and it is also associated with the level of anxiety. A student who believes he/she has some control over *what* is learnt and *how* it is learnt will suffer from little or negligible anxiety, in comparison to a student who has little or no control over their own learning. Anxiety is a negative state of mind and it operates in a cycle, which has a tendency to

spiral ever decreasingly downwards. However, anxiety can be controlled by the teaching and learning or educational environment, and teaching and assessment. Motivation, on the other hand, is even more personal. It can be intrinsic or extrinsic - internal or external. The student can be highly committed or less so, but more importantly, motivation is dynamic, it can change and evolve from the negative to the positive or vice versa.

The model (Figure 9) seeks to develop existing knowledge and to incorporate the ideas of anxiety, motivation, depth of understanding and learning, locus of control and intellectual development under one model. This model follows along the same lines as traditional theory, but it is used as a vehicle in the reapplication of ideas about teaching and learning in Higher Education. The optimal level of academic performance is at the apex of the curve and it is at this point where the student experiences a sense of equilibrium or a balance in learning. The student is stimulated (i.e. interested) by the degree and is committed to the degree, but at the same time, neither over-stimulated nor overly anxious or worried by the demands placed on them by the degree programme.

An underachieving or failing student can be experiencing either no stimulation (the module or degree programme is boring or perceived as unachievable) or the student is over exposed to too much work or is out of balance (it is too motivated, highly committed, seeks understanding, is internally in control and has a developing or well developed intellect). In some cases, the student could be experiencing both situations. It is argued that a good teacher in Higher Education will strive to maintain a balance and therefore secure an optimum academic performance level for each individual student at all times throughout the three years of the course.

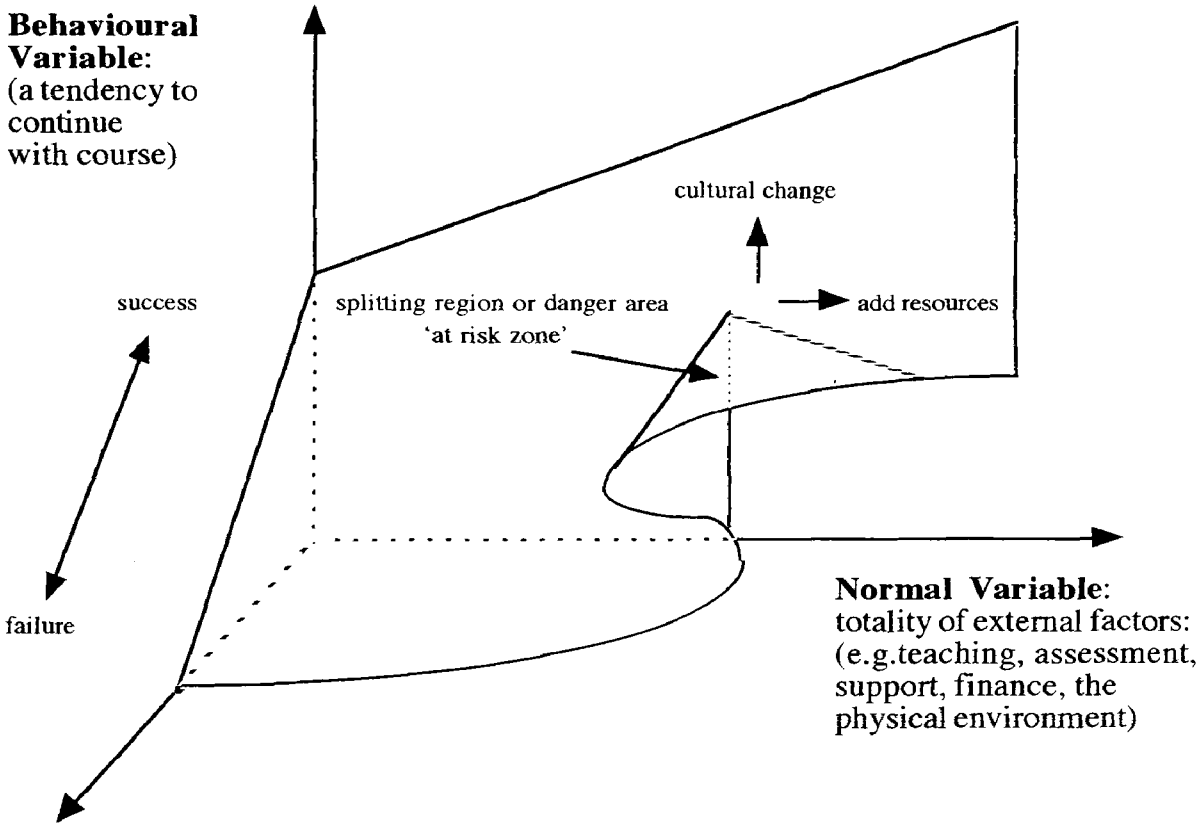
5.2.4 Model (4) The potential application of catastrophe theory to the identification of students 'at risk' of underachievement, withdrawal or failure.

Finally, a fourth model has been constructed and this is an attempt to relate catastrophe theory with student non-completion. The introduction of catastrophe theory to education was first made by Elton (1996) and Cryer & Elton (1990) and looked at mainly at motivational factors. Figure 10 seeks to suggest ways in which catastrophe

theory could be used to illustrate and further develop understanding of student non-completion in Higher Education.

Figure 10

Model (4) Catastrophe Theory and student non-completion



Splitting Variable: totality of internal factors:
(e.g. self-confidence, acquisition of skills, motivation, level of commitment, perceived treats, level and type of entry qualifications)

Figure 10 identifies the splitting variable(s), normal variable(s) and the behavioural variable - progression and retention (a tendency to complete the course) or underachievement or withdrawal. The splitting variable and normal variable, in this case, is represented by a totality of known factors. For the splitting variable it is the totality of the known internal factors (the factors the student has some level of control over), e.g. self-confidence, acquisition of key skills, motivation and commitment. For the normal variable, it is the totality of external factors which is represented by factors

such as: teaching styles, assessment regime, pastoral support, finance and the physical environment (university location, site, accommodation).

The diagram (Figure 10) more importantly provides an identifiable splitting region or danger area where the student can be identified as 'at risk'. This triangular zone as been identified as the point of 'at risk' or where the student may show signs of having difficulties. To the left-hand side of this zone the student either withdrawals or becomes a referral and once the student reaches this point and passes it it may be difficult, if not impossible, for the student to return. When looking at what can be done to address student non-completion, two obvious solutions arise: (i) add resources (e.g. provide students and universities with more money) or (ii) change the culture within the university (e.g. change teaching styles, assessment regimes or offer more supplemental instruction).

5.3 Presentation of a composite eclectic theoretical framework - summary

The aim of this theoretical framework is not to contradict existing models of student academic performance and non-completion, but to add a new dimension to the understanding of multi-dimensional problem of student non-completion across all levels and to seek answers to why student non-completion (on the building degree programme) may be occurring, especially in Levels Two and Four.

The Tinto model of student non-completion in comparison is very simplistic and it is very reliant on only a few contributory factors (it individual attributes, goal and institutional commitment, academic and social integration) and their relationship to the academic system and therefore overall grade performance and intellectual development. The Tinto model as a result fails to provide a true longitudinal picture of non-completion (i.e. a study of academic performance from the induction phase right up to graduation). The Tinto model is in essence, a snap-shot study of non-completion from university; a study of the longitudinal process which results in the decision to drop-out.

The second model - Student Typology sought to identify the type of student who may

be academically 'at risk' of underachieving or failing his/her degree programme. The 'at risk' student exhibits a series of attributes such as: no career aspirations, no commitment to any academic or personal goal, course work and workload stress, alternative academic background, immaturity, poor course work and examination preparation and technique.

The third model - the Inverted U Model explains why students may be experiencing difficulty at university. The Inverted U Model further explains why the student does not perform well at university by adapting a traditional theory on performance and stimulation to incorporate ideas about anxiety, motivation, study behaviour, surface and deep learning and the perceived locus of control.

The final model - The potential application of catastrophe theory to the understanding and possible identification of students 'at risk' of underachievement, withdrawal or failure.

The resulting theoretical framework is essentially composed of four parts: the developmental or progression and retention model, the typology 'at risk' model, the inverted U model and a model using catastrophe theory. Each model seeks to illustrate and explain a different dimension of student academic performance, progression and retention in Higher Education. In essence, the 'when', the 'who' and the 'why'. It is hoped that by creating a theoretical framework which is multi-dimensional, a clearer picture of student academic performance and more importantly, negative performance, will emerge.

Chapter 6. Discussion

6.1. Introduction

This chapter considers existing knowledge in relation to the results of this research and links existing knowledge with future research requirements. The focus of this work has been driven towards study-related or institutional-related concerns, and as a result the data for this work has been collected from three main sources, but it has been analysed in two different ways. The final purpose of this research has been to work towards providing various educational policy recommendations and to initiate policy change, both managerial and academic.

The overall objective of this research has been to describe and explain in some detail specific events and to illustrate the findings from this research in an explanatory theoretical framework. However, the nature of the work and the area of study under review dictates that for practical reasons the model created has some useful purpose. Therefore a fine balance needs to be made between creating and building a theory, and its ultimate application. The model must not be too complex, but readily understood and applied by all academics. Furthermore, this new theoretical framework must provide some practical information which can be used on a consultancy basis.

This chapter will essentially fall into five sections.

- critical evaluation of the new theoretical framework set out in Chapter 5
- description of the theoretical framework in terms of academic/personal issues that students currently face
- discussion of data and information
- evaluation of the importance of the proposed framework to educational research
- consideration of the limitations of the model

6.2 Theory building and theory testing

6.2.1 Introduction

The process of theory building is said by some philosophers to be an orderly process from which a description is concerted into a taxonomy and therefore into a testable set of causal propositions and relationships (Breakwell, Hammond & Fife-Schaw, 1995). The first task is to thoroughly and systematically describe the phenomena being studied. The second task is to categorise these phenomena. These categories are then given a label and identified as a variable. Theories of learning usually categorise two constructs: stimuli and response. Finally, a taxonomy is completed and a relationship between the various parameters/phenomena is determined. This can be done either via a systems analysis approach or by creating a developmental or staged model.

The aims of this research have been to develop a multi-causal or eclectic and explanatory model of student academic performance. This has been achieved in two stages:

Stage One - investigating entry routes; intellectual development; approach to studying and academic performance at university.

Stage Two - considering more qualitative data obtained through interviews with students at Level One and Level Four.

In order to provide a comparison. One set of '<u>at risk</u>' students was compared to three types of <u>successful</u> student. The results from this study have been illustrated in Model (2). Finally, the main aim and objective of the research study was to develop a theoretically-informed investigation of the interaction between social, academic and personal factors contributing to non-completion. This has been achieved by constructing a theoretical framework. The main aim of Chapter 5 was to develop and then fully present this theoretically informed investigation of a multi-causal and eclectic, explanatory model of academic performance and non-completion. Chapter 5 introduced a new theoretical framework based on three models: (1) the developmental or staged model of crisis points and possible points of deflection, (2) a student type 'at risk'

model and (3) the inverted - U model and (4) the application of catastrophe theory in identifying student 'at risk' of underachievement, withdrawal or failure. The first two models have been based on data and information collected via a range of sources: background data, diagnostic testing, inventories and interviews, while the third and fourth models are based on established classical theories. The third model is based on well established psychological theory, while the fourth is based on catastrophe theory which is taken from topological mathematics. Where the aims of Chapter 5 were purely descriptive, the aims of the first part of this chapter are to provide a critical analysis of the models and the theoretical framework they create. Finally, this new theoretical framework will be considered in the light of its links with previous knowledge and previous theoretical models.

6.2.2 The construction of a multi-causal or eclectic model of academic performance (a study of progression and retention)

This part of the model constitutes the main focus of the framework. The model follows along the lines of both the works by Tinto (1975, 1982 & 1988) and Perry (1970).

The Theoretical Framework

The longitudinal process of student academic performance and departure, both literally (student non-completion) and academically (level of performance) is described and explained as being made up of several distinct stages in learning and intellectual development through which a student must pass through during the process of an undergraduate career (Elkeland & Manager, 1991). The general notion of stages for *rite of passage* may be reflected in the model. Each stage is marked in a rough time frame and each stage is associated with individual inabilities to solve the problems that arise in those stages. In the early phase, departure is more likely to result from an inability to cope with a new way of life and a difficulty in separating from a past life. In the later stages, poor study skills, inappropriate and overambitious allowance of time with coursework, poor examination preparation and technique, poor attendance results, indicate a student who could end in withdrawal or referral.

The modelling of student progression is considered at each stage as follows:

Level One

(1) Entry Statistics: Students enter onto the degree programme in Level One via three main routes: school, college of further education and the work environment. To mark stage 1 (or the Entry Phase), pre-Higher Education entry qualifications were studied and then correlated with subsequent examination performance at University for Levels One, Two and Four. In Chapter 4, it is noted in Section 4.1 how changeable the entry statistics can be. In 1994-95 the student entry onto the degree programme was largely confined to the BTEC (Construction) route at 83.7%. In 1995-96 this figure had dropped back to 45.2% with an increase in the number of students entering with an A' Level academic background in subjects such as: mathematics, geography and from the humanities. This also corresponds to the increase in the number of referrals which rose dramatically from 9.5% in 1994-95 to 22.6% in 1995-96. In terms of finding a relationship between pre-Higher Education entry qualifications and subsequent examination performance at university, there is little firm evidence to support previous assertions that there is a positive relationship between A' Level and BTEC grades and later academic performance at university. As a consequence, it would be unreliable to use pre-Higher Education qualifications as a predictor of further academic performance at university.

(2) Induction Phase: The model uses the term "Induction Phase" to describe four main stages in development: emotional and cognitive SEPARATION, TRANSITION, INDUCTION and social and academic INTEGRATION. The literature identifies in very loose terms what could be described as an Induction Phase. This phase, however, extends long after the official period of induction and may last up until the Christmas break and beyond. This phase marks the first points of change and therefore it is the first main point of potential crisis and a potential risk to student retention. The three main obstacles to cope with at this stage are: Firstly, a personal and 'emotional' SEPARATION and a cognitive SEPARATION. The student is suddenly faced with a new physical environment and a new learning environment and all place new demands and expectations onto the student which have to be met. Known and stated reasons for withdrawal at this point fall into two distinct categories: (i) academic reasons (wrong course chosen, transfer to another degree programme within the same institution, the

mathematics is too difficult or the student found the work too difficult) and (ii) personal reasons (transfer to an alternative university nearer home or that the student was unable to settle because of accommodation problems). The reasons cited for non-completion are therefore both precise and realistic. However, they may also be indictors of a failure by the individual to properly assess their own needs and wants in relation to the degree programme they have chosen and subsequently to properly separate themselves from the past, to transgress onwards and then to integrate into the university community, both academically and socially. Secondly, the TRANSITION and INDUCTION stage represents a point in development directly after separation. The student needs to be able to outweigh the pros of being at university against the cons, before they can fully integrate into the academic and social system of the university. Finally, social and academic INTEGRATION. The student needs to integrate into the university as quickly as possible. Ideally an even balance of integration is required between the social and academic communities that come together to create the whole student experience. Tinto (1975 & 1982) recognised integration as being a major process which determines whether a student stays the distance or leaves the degree programme and therefore the university.

(3) Workload Phase: The workload or workload crisis phase dictates the point where the student first experiences coursework. This point also marks the first point of academic integration, and with it, brings further challenges. Is the student capable of completing the work set? Will a lack of self-confidence interfere with the process? Will the student's previous experience and academic background support this transition from pre-Higher Education to Higher Education? The Workload Phase is often marked by a significant propensity by the student to leave the work until the last minute. This problem is usually exacerbated by the 'bunching' of assignment due-in-dates towards the end of each semester.

(4) Positive & Negative 'pathways': Throughout, and on the completion of the three main stages or phases, the student in Level One can be broadly divided into two main types: those who are obviously academically 'at risk' and the remainder who are more likely to be successful at the end of the semester and the level. The students who

are more likely to be academically 'at risk' are those who express certain reservations about the degree programme or where the student-to-degree programme match is evidently incompatible. The factors which determine whether a student is 'at risk' include: personal immaturity, alternative academic background, poor examination preparation and technique, a lack of confidence (especially evident in the more mature students), a personal decision or conflict between earning money full-time and studying full-time and the obvious student-to-degree mismatch.

However, in Level One, the more successful students adopt or possess certain positive drives or personal and academic coping strategies which lead them onto greater success. For example, high commitment, numerical and mathematical competence, high career aspirations and motivations, quick adjustment to the evolving changes in educational environment, good practical experience and a balanced social and personal life.

(5) Examination Phase: The introduction of Semesterisation in the early 1990's brought with it the necessity to examine all students at the end of each Semester. This potentially doubles the number of critical or crisis points the students have to face and cope with.

Research work conducted at Oxford University noted a difference in basic psychological processing in students during the weeks just before the examination period (Martin, 1997). This study focuses on emotional and cognitive effect of examinations in female and male students. Martin (1997) found that both gender and examination proximity were associated with significant changes in anxiety, especially for female undergraduates. This study concentrates on a largely male student population, but from a general point of view, the work by Martin (1997) highlights how examination anxiety influences academic performance. Martin (1997) discovered that educational assessment at Oxford and Cambridge, rightly or wrongly, tends to reward a style of academic work which is confident, bold and assertive. Martin (1997) also examined the students' levels of short-term anxiety as a function of gender and examination proximity. Results showed that anxiety was significantly higher close to

an examination than when distant from one. Close to the examination there was a significant rise in short-term depression and a significant decrease in short-term happiness. Martin (1997) suggests there are differences in psychological processing concerning academic assessment and these are more pronounced when an examination is imminent. In her conclusion, Martin (1997) suggested further support should take the form of an indirect measure designed to reduce levels of anxiety or of direct measures designed to enhance the student's skills in developing and presenting a bold and assertive argument in examinations. This work seems to suggest that the student's self-confidence is an important factor in determining academic achievement and suggests that institutions should take steps to 'train' students in two aspects (i) to reduce general levels of anxiety, stabilising the student's general psychological well being and (ii) to design study skill sessions that academically prepare the student to cope with academic life during the examination period.

Since the introduction of Teaching Quality Assessment (TQA) procedures in 1993-94, recommendations from this process suggest that it may be desirable to reduce the reliance of the traditional unseen examination (Healey, 1996). This form of assessment could easily be reduced and replaced with a varied and continuous form of assessment procedure and one more reminiscent of the working world. However, this balance of assessment will depend upon the discipline type and any professional requirements imposed upon the degree programme under consideration.

(6) 'At risk' and non-completion: The numbers of students academically 'at risk' of not completing their degree programme falls between Level One and Level Two, but there is a slight rise again in Semester One and Two in Level Four (Figure 7). The numbers of students actually failing to complete any given semester or level tends to fall dramatically after Semester 2 in Level One. In Level One the average non-completion rate for years 1994-95 to 1995-96 is 21.67%. However, this is cumulative and the majority of withdrawals occurs in Semester One with an average of 14.67% of the 21.67% leaving before the end of the first semester.

Semester One in Level One marks a period of great uncertainty. A majority of students

who leave the degree programme do so at this point, especially in Semester One (average over two years of 1994-95 and 1995-96 is 14.67%). Withdrawal or non-completion, therefore seems to be restricted to a minority of individuals who embark upon the degree programme without fully considering their other options beforehand. A majority of the students actually interviewed stated that to leave the degree programme after this period would be a waste of time committed to date and the students who remain on the course do so because of a time induced/time invested type of commitment to the degree programme.

Level Two

(1) Entry Phase: In Level Two the students enter via two main routes: Level One of the degree programme and via the HND programme.

(2) Positive & Negative 'pathways': Throughout and on the completion of the three main stages or phases, the students in Level Two can be broadly divided into two main types: those who are obviously academically 'at risk' and the remainder who are more likely to be successful at the end of the semester and the level. The factors which determine whether a student is 'at risk' include: the inability to cope with a heavy workload or to cope with any work at all. This is clearly related to the student's motivation and commitment to the degree programme.

(3) Performance Indicators: The potentially successful student in Level Two is the student who exhibits a distinct positive drive. This includes: increasing self-confidence, self-determination, a strong commitment to personal goals and an increased professional attitude to working. However, the student 'at risk' is more likely to experience real or perceived increasing workload pressure which overwhelms them to the point where they find it difficult to cope. This situation is made worse by a lack of self-confidence or, in some cases, learning anxiety and a poor level of commitment to the degree programme and the course content at that moment in time.

(4) Proximity to end of semester examinations: Potentially successful students in Level Two, in general, approach their end of semester exams with greater

confidence than in Level One. In general, Level Two students have or are beginning to develop good research and studying techniques and may be also developing a better approach in preparing for exams. However, conflict does arise for some students between understanding academic theory and its relationship with practice.

(5) Level Two - Semester B: The second semester in Level Two is marked by an increase in workload; this is largely by design. The second year student embarks upon an intense work programme which includes a great amount of group-based coursework. This is in addition to normal preparation for end of semester exams.

Average non-completion at the end of Level Two is relatively reduced at 5.20% in comparison to the non-completion figure of 21.67% at the end of Level One.

Level Four

(1) Entry Phase: In Level Four, students enter via three routes: the sandwich degree placement year, from Level Two or directly from the construction industry.

(2) Changing Standards: The most notable change from Levels One and Two and the Final Year is the change in balance between Technology and Management. In Level One, the teaching focus is directed more towards the understanding of Building Technology. By Level Four, the teaching focus has shifted more towards the Management of building projects. This change is also accompanied by a steep increase in the academic and professional standards required by the students in Level Four and for the final examinations.

(3) Shift in Cognition: The most notable change from Levels One and Two and the Final Year is the change in balance between building technology and building management. The degree programme evolves from a Level One programme which has a teaching bias towards the science and technological aspects associated with the study of building. This develops through a gradual shift in emphasis and focus in teaching towards the managerial aspects of the building industry in Level Four. The change in focus of the degree from technology to management poses clear problems for some

students, especially those who are more technically and practically minded. The degree programme is multi-disciplinary and as a consequence can present the student with a wide range of intellectual and skills-based demands.

(4) Positive and Negative "Pathways": In Level Four, the tendency is for all students to follow along a 'positive' pathway. At this stage, the student's resilience to change and difficulty is met by a positive reaction to the crisis enhanced by: changing motivation (a shift more towards intrinsic and achievement motivation), increased personal and professional commitment to a career in building, an increased personal maturity, an increased and constantly evolving intellectual development and an increased awareness and appreciation of building management. However, final year study does not automatically guarantee the successful completion of the degree programme. A 'negative' reaction to a personal or learning crisis can include: a falling level of commitment, a bad response to the change in educational focus (i.e. more management), the step-up-in-standards and the problems faced as the student has to readjust to academic life after a year out in industry.

(5) Factors indicating performance: During the process of this research, a second model was constructed - A typology model. This part of the theoretical framework was conceptually the most difficult part of the theory to construct. This part of the model is subjective and dependent upon the researcher's own perception and point of view of what would signify a student 'at risk', and conversely, what factors determine a 'high' flyer or very successful student. As yet, there are no qualitative research methods that can satisfactorily resolve this problem of accommodating both objective and subjective elements of study (Pidgeon, 1996). However, the quantitative alternative - psychometric testing (i.e. intellectual development and approaches to studying inventories) fails in view of this research, to successfully indicate which students would be academically 'at risk'. This would suggest that there is currently no adequate method for testing, but this research has pin-pointed various factors which determine 'at risk' stages. The qualitative approach, (i.e. interviews and the merger of background data to form a series case studies), in this case, is the most effective source of information available.

6.2.3 The construction of a Typology Model to identify 'at risk' students

The second part of the theoretical framework identifies the key factors which determine levels of student academic performance - the factors which either promote or damage potential academic performance.

6.2.4 The construction of an inverted U-Model

This part of the theoretical framework adopts an idea from classical psychology. Classical psychology describes the relationship between learning anxiety and academic performance in terms of an upside down or inverted U shape. Too little anxiety - the first side of the U brings about apathy and this is accompanied by too little motivation, while too much anxiety - the other side of the U - inhibits any attempt by the student to do well.

It is therefore agreed that learning anxiety can damage or enhance mental performance and therefore academic performance. The key to an optimum performance is a balance between too much anxiety or stress and too little anxiety or motivation. On the one hand, stress and worry are sometimes useful responses to a problem - a natural mental preparation for an anticipated threat. Too much anxiety, however, undermines the intellect. In any complex and intellectually demanding situation, a student with a propensity for high anxiety, is more likely to experience learning difficulties at university. Non-traditional students by their very situation may be more likely to worry about their position in Higher Education than traditional students. This anxiety, is of course, promoted by a lack of confidence in one's own ability to adjust to academic life. In many ways, this anxiety is unfounded, but it takes time for the student to adjust to a new set of tasks and new ways of thinking. To succeed, the mature student needs to be highly motivated and committed to studying for a degree and capable of withstanding any problems (private or academic) that present themselves during the course of the degree programme. The institution must be prepared to address this as a lack of confidence among the non-traditional entrants (Hebb, 1972; Goleman, 1995).

Anxiety also undermines academic performance of all kinds. The more prone a student

is to worrying, the poorer their academic performance in general. For people who are too anxious, apprehension interferes with their clear thinking and memory development necessary to study effectively. This type of problem is more likely to be apparent within the non-traditional element of the student group (i.e. those students who have been away from studying for a long time or those students who have joined the degree programme from another background) (Hebb, 1972; Goleman, 1995).

6.2.5 Catastrophe Theory - student progression and retention

Finally, recent studies by Cryer & Elton (1990) and Elton (1996) use the idea of catastrophe theory to explain educational change and student motivation. Cryer & Elton (1990) and Elton (1996) also incorporated the thinking behind earlier works on student motivation by Entwistle & Ramsden (1983) and took the process a step further by incorporating elements of withdrawal and the changes in motivation which determine examination preparation and therefore the final academic performance.

Elton (1996) argues that if the lecturers' learning objectives were identical to the objectives of the assessment, then the problem of the students being wrongly motivated would largely disappear. It is argued that a correctly balanced selection of assessment modes and careful module and degree programme planning may improve student levels of motivation and commitment and therefore efforts could be made to eliminate and reduce levels of non-completion. It is also argued that the current educational environment (i.e. the introduction of Teaching Quality Assessment) could seek to assess and evaluate the impacts of various assessment types on student satisfaction, motivation and ultimately academic performance.

Elton (1996) succeeded in providing a theoretical basis to the broad concept of student motivation by relating it to the Herzberg Theory of Motivation in the work place. Herzberg's theory states that two main factors affect attitudes to work: (1) satisfaction with the working environment (i.e. achievement motivation) and (2) the working or environmental factors which lead to extreme dissatisfaction. Cryer (1988) and Cryer & Elton (1990) reconceptualised Herzberg's Theory into diagram (Figure 2). This diagram illustrates how intrinsic and extrinsic factors interact with motivational factors

(i.e. extrinsic, achievement, social and intrinsic motivation).

Catastrophe theory is conceptualised by Cryer & Elton (1990) and Elton (1996) and is recognised as an important element to be included in the creation of a new model of student academic performance and non-completion. More importantly one which studies the significance of the extremes in academic performance - failure and success. The theory put forward by Cryer & Elton (1990) and Elton (1996) carefully explores the relationships between two factors: extrinsic (examination preparation) and intrinsic factors (the desired level of achievement and the level of subject interest) and the resulting levels of motivation. This studies whether the student's motivation is extrinsic (cue-seeking), the student is cue-deaf, the student is likely to withdraw, the student has low commitment to his or her studies and alternatively is in a state of rebellion and disillusionment. For the purpose of this study, the most important outcomes are withdrawal and rebellion. In Figure 2, withdrawal is a result of a student with a low to positive intrinsic motivation (i.e. no real desire to achieve academically and no subject interest) and unfavourable extrinsic factors (i.e. poor examination preparation and technique), misunderstandings over what is required in terms of assessment and poor studying and learning skills.

The work by Cryer (1988); Cryer & Elton (1990) and Elton (1996), helps to illustrate that a low desire for academic achievement and poor academic integration (i.e. low intellectual development and poor study skills) can result in early withdrawal. Rebellion or underachievement may be determined by poor academic integration (i.e. poor studying skills, a lack of adequate private study and a high level of disillusionment and dissatisfaction with the degree programme, a desire to transfer to an alternative course, a high subject interest, but one which does not match to the content actually delivered and tested) may result in at best rebellion and underachievement and at worse withdrawal or failure.

In terms of this work, Chapter 5 attempts to develop a multi-dimensional model using a data collected from a range of research methods and a range of approaches to model building and theory making. The work by Thom (1975) and Zeeman (1977), but more

recently by Cryer & Elton (1990) and Elton (1996) offers a foundation from which catastrophe theory has been applied to illustrate and explain student progression and retention or conversely non-completion (Figure 10). Figure 10 identifies the splitting variable(s), normal variable(s) and the behavioural variable - progression and retention or a tendency to complete the course. The splitting variable and normal variable, in this case, is represented by a totality of known factors. For the splitting variable it is the totality of the known internal factors and for the normal variable it is the totality of external factors, which are out of the student's control. The diagram also identifies a splitting region or a triangular zone where the student can be identified as 'at risk'. It is suggested that the well established theory, catastrophe theory, could be used and developed to assist in the early identification of students 'at risk' of non-completion of their degree programme and used as part of an early warning system.

6.2.6 The construction of a complete theoretical framework

Theory building and theory testing in this research relies upon the generation of a theory which has been created out of semi-structured interviews, data collection and the resulting case studies. The theoretical framework created as a result of this research is based on the concept of 'grounded theory'. In the case of grounded theory, the generation of a concept and therefore a reliable theory, is dependent upon the development of a continuous inter-play between emerging data and the researcher's conceptual and creative abilities. The use of this approach is preferable because of the richness of the data it produces and in the clarity of the theoretical framework it generates. The theoretical framework can also be created into 'multi-dimensional' form. This framework, uses three elements to explain four important, but basic processes: the 'when', the 'how', the 'who' and the 'why'.

6.3 Links with previous knowledge

6.3.1 Introduction

No explicit theoretical framework for non-completion existed until the early 1970's. The Developmental or Staged Theory Model created as a result of this research was inspired by two existing models: Tinto's longitudinal model on drop-out and Perry's

scheme on intellectual and ethical development. A further model or simulation-game was created at around the same time by Entwistle and Wilson (1977). Entwistle & Wilson (1977) combined research findings from Lancaster University with results obtained from Aberdeen University to produce a model of student learning in the form of a three-track game which is represented by the arts, sciences and social sciences. The tracks contain a series of coloured squares labelled 'Bonus' (for example, inspiring tuition, stimulating tutorial group), 'Hazard' (boring lectures, a badly organised course, tutor is sarcastic), and 'Chance' (decides on a career, student finds another subject more interesting, a death in the family). The game was created for two purposes. First to help students understand the way in which their experiences at university may affect their academic performance. The game has one great advantage of being dynamic - it allows fortunes to change over time. Secondly, it drew attention to the way students of a different personality are likely to react to different experiences. The Typology Model, however, looks at the main determinants of student performance from both a negative and positive perspective. The inverted U-Model, however, is a more focused and more precise model and it offers a psychological reason for a suppressed academic performance.

6.3.2 The Developmental Theoretical Framework

Tinto's (1975) theoretical framework was based on the concept of integration and held the view that those students who have integrated into the social and academic fabric of the institution were less likely to leave (Thomas et al, 1996). Tinto (1975) included background factors and the experiences of students after admission into the institution and his research study resulted in the creation of a developmental model of student non-completion. However, the theoretical framework generated for this research project does not include background factors, largely because evidence has been produced to suggest that background factors have a limited effect in determining the final level of performance in Higher Education. More importantly it addresses the experience of students from admission to graduation in its attempt to describe and explain the longitudinal aspects of the student academic experience of a *higher education*..

Tinto's model is solely concerned with the process of non-completion and relies on

very few contributory factors in its description and explanation of the student experience. Tinto's model is limited to the factors of: commitment (goal and institutional), integration (academic and social), student (personal and academic background), faculty and peer group interactions, grade performance and intellectual development (see Figure 5). In essence, the Tinto model focuses on student integration and commitment, both to the discipline being studied and the university.

Tinto was aware that existing theoretical models on student non-completion failed to give adequate attention to the processes individuals experience as they pass through Higher Education and for some, as they depart. The model created as a result of this research, seeks to address this deficiency by mapping out the longitudinal pathways students follow and the main points of potential crisis and the possible points of learning and intellectual development. The model considers two main pathways - successful completion and unsuccessful non-completion. Like Perry's model of intellectual and ethical development, the developmental model indicates the potential points of deflection or drop-out.

Tinto (1982) recognised at the time that there was no 'grand theory' to explain non-completion in Higher Education. However, it is debatable whether any theoretical model could explain the wide range of behaviours and processes that result in a successful or unsuccessful academic performance. Further research is therefore required to identify and understand the factors and processes which result in students either underachieving, withdrawing or failing their degree programmes by attempting to track undergraduate student movement from one developmental stage to another and to provide a new theoretical framework for further analysis.

Tinto (1982) criticises several obvious shortcomings in his own model. Firstly, the model does not emphasise the role of finance in the student's decision making nor does it reflect what effect debt may have on the student's performance. Thomas et al (1996) in a recent study of student withdrawal, noted that sixty percent of students leave because of 'personal' reasons, fifty-two percent of those who leave gave 'course' reasons and thirty-two percent gave 'financial difficulty' as a reason for withdrawal.

However, the results from interviews conducted in this research project suggest that finance is not a significant factor in the students' decision making process. The majority of the students who do leave do so within the fourth month of Semester One in Level One before finance becomes an issue. Secondly, many students either come from the local catchment area and live at home and those who live within the confines of the university received adequate financial assistance from their families and/or worked part-time to support themselves.

Tinto (1982) identified several areas for further study, recognising that future research should seek to take into account the longitudinal character of non-completion. Past studies of academic performance and non-completion have often taken a limited time perspective. This model considers just two points in time: the point of entry and the point of drop-out. Tinto realised that the forces that lead to drop-out in the early stages of an academic career are very different from those that influence later departure. This research studies academic performance as a longitudinal process.

The longitudinal process of student academic performance and departure can be described and explained as being made up of several distinct stages of development through which a student must pass during the course of programme of study. The general notion of stages or *rites of passage* may be clearly seen in the model. American attempts to address the problem of student non-completion (i.e. Tinto and Spady) have been limited to the description of a continuous cycle of integration and commitment. This theoretical model considers a more clearly defined time-frame of possible events and crises associated with individual inabilities to solve problems that arise in those stages. In the early phase (the first four weeks), departure is more likely to result from the inability to cope with a new environment and way of life and an individual student difficulty in separating the past from the present. However, this is not the only main reason for departure at this stage. Many students leave in the early stages because of poor personal decision making and career planning on their part. In the later stages, poor study skills, time management associated with coursework, poor examination preparation and technique, and poor attendance result in underachievement and referral.

Recent research commissioned by the Higher Education Funding Council for England (HEFCE) in 1997 looked into the extent, nature and causes of non-completion and concentrated on two focus points. The first part examined the reasons for non-completion and the cost of non-completion to the tax-payer. The second part explored the experience of students who do not complete their degree and the measures institutions could take to reduce the numbers of individuals who do leave.

6.3.3 Intellectual and ethical development

The work by William Perry (1970) shows there is indeed a basic progression in the ways of thinking and in the form of thought in the late adolescent to early adulthood years. Perry's basic research findings trace the path from adolescence into adulthood. The development traced takes place in the form in which the student perceives the world rather than the 'content' of the learning which has taken place. Perry's longitudinal study is therefore concerned more with the 'process' of learning and not so much with the 'content' of what is learnt at the higher educational level.

The stages, or positions in Perry's (1970) theoretical model of intellectual and ethical development are hierarchical and sequential. Movement from one stage to the next is brought about by a learning experience which is incompatible to the student's current cognitive structure and thought processing. As with all developmental models, disequilibrium results and the student moves to the next position to regain a new equilibrium (Stonewater, Stonewater & Hadley, 1986).

Perry describes the journey students take as they pass through their degree programmes. The starting point begins with dualistic thinking (i.e. everything is either black or white, right or wrong) and the 'destination' is relativistic reasoning and committed thinking. A series of stages or 'positions' are identified (nine positions grouped into four categories). One of the aims of this research project has been the search for indicators of student academically 'at risk' of underachievement, withdrawal and failure (referral). Perry's model or scheme identifies possible interruptions in the student's academic progression between the first and the second categories in the model. As a consequence, Perry identifies periods of delay, deflection and regression

in learning and intellectual development or as Perry describes: temporising, retreating and escaping. However, Perry's model is idealistic and it would be very difficult to identify if a student was 'at risk' by using the current Intellectual Development Inventory (IDI). Firstly, because the inventory is not precise enough to detect individual positions within each stage, and secondly, if the inventory was an efficient tool in identifying the exact point the student is on within the model, it would have very little predictive power because of the time lapse between the testing of the student and attempts to address the individual student problem.

A main criticism of all cognitive models (Piaget, Kohlberg & Perry) is that they assume that all stages or levels of development are sequential and hierarchical. They also suggest that each stage represents a qualitative difference in the way individuals approach their study tasks or in the way they think (Perry, 1970). In reality, these boundaries are blurred and occur for different students at different times.

Perry's scheme was created by design to describe the development of student reasoning about knowledge (Parker, 1978). It is argued that a student must have gained a certain amount of knowledge and must be certain of that knowledge, before development can take place. Once a student has obtained a certain level of knowledge and experience, both of the theoretical and practical world then real development takes place and the student moves on to the next 'stage'. At this point the student develops a sense of personal maturity - and this is evident when interviewing Final Year students.

6.3.4 The Typology Model - Who is 'at risk'?

The second model, created for inclusion into the theoretical framework, is the Typology Model. The Typology Model seeks to identify and present those factors which determine and therefore give clues as to which students may be 'at risk' of underachievement or referral. In comparison, the model also provides a rundown of the factors which determine and indicate those students who are likely to do well at each Level.

A student 'at risk' is one who is highly likely to be unsuccessful in terms of assessment

and examination performance. The next step down from this, is the student who is likely to underachieve. This student will complete the degree programme 'successfully', but not to the level he or she is capable of. All institutions of Higher Education would like to be able to predict the characteristics of successful students (Wright, 1982). All institutions of Higher Education would regard all graduating students as successful. However, some students may be seen as underachieving or unsuccessful if they have achieved a degree classification lower than the one they should have achieved. Finally, there are the students who demonstrate a steady performance and achieve their potential, gaining either an upper second or first class degree classification.

The main purpose of this study, however, is to identify those students 'at risk'. From the literature, Tinto (1975) noted that students who fail assessments and/or examinations and are referred for resubmission and re-sits, often lack both the intellectual and social skills required at university. Academic dismissals, are more likely to be too integrated into the social side of university life and as a consequence the academic demands and responsibilities of the degree programme are unmet. In contrast, those students who withdraw and leave voluntarily have not succeeded in being integrated in any way. It is particularly difficult to predict which students will fall into this category, until some form of assessment or examination has been made (i.e. at the end of Semester One). However, the level of attendance per modules has been questioned by some lecturers who feel it is impossible to perform well on a module or course if attendance is poor.

The differences across the student body

Entwistle & Wilson (1977) analysed students from Aberdeen University and concluded that two key features determine success in the first and final years. In the first year, an immature outlook exhibited by some students accounted for 50% of all referrals. Alternatively, in the final year, high levels of motivation and good studying skills were associated with a good degree performance. Immaturity in attitude and outlook manifests itself as either over-dependence on family and the institution for support or as a rebellion against authority.

Motivational factors

Theorising about student motivation has progressed from a crude stimulus-response idea, through to a reason-based-questionnaire approach. The work by Entwistle & Ramsden in the 1970's produced a series of questionnaires aimed at the testing of individual student approaches to studying and learning motivations. However, this attempt failed to produce a problem free investigative tool owing to the complexity of the problem and the different types of motivation that exist. Instead, Entwistle & Ramsden concentrated on just three types of motivation: intrinsic, extrinsic and strategic.

In the 1970s, Stage (1988) studied the relationship between student typology successful academic performance and non-completion in America. Stage (1988) discussed how social-psychological indicators could be used to create student typologies for use in future research. Stage demonstrates how motivation theory for grouping students can be used to identify and predict how well a student will perform at university. Stage found significant differences among three subgroups of students in terms of their motivational type: cognitively oriented, certification reasons and those students who want to study for the wider benefit of society. Stage notes that the differing motivations of students would require different learning strategies to facilitate a successful learning experience. For example, students with a cognitive orientation need a broad range of intellectual demands in the course. Students who attend for certification reasons and those with a motive to serve society need positive peer and staff relationships to further their commitment to the university.

Recent studies of student motivation

It is widely agreed that the subject of student motivation is very complex and it is influenced by a number of different contextual layers of: personal orientation, personal aspirations, career aspirations, social culture, and the current political and economic context. Newstead (1997) notes that there is a wide-spread agreement that motivation is a critical, if not the most critical, factor in determining student success in Higher Education. However, there is relatively little evidence to suggest exactly what does motivate students and what kinds of individual differences exist. Newstead (1997)

identified in a recent study a number of motivational factors he thinks are important: a desire to gain a qualification, a desire to develop knowledge and skills, an opportunity to study a subject in depth, to broaden personal horizons and to develop an active social life. Newstead (1997) also believes that very few fundamental changes occur in the student's motivation over the first few months at university.

Higher Education is now seen as a serious business investment in which the goals of achievement are kept in focus and in control throughout the learning process. Students now have a greater feeling of control over their own education in comparison to students of the 1980's and before. A student who increasingly has to self-fund his or her own education will expect value for money. However, there is a risk that the student body will soon demand more of a product of education rather than an experience in the process of learning in Higher Education (Newstead, 1997). Of particular concern is that Higher Education in the UK will become devalued. Results from this study of progression identify and support the theory presented by William Perry which advocates the promotion of a teaching and learning strategy which encourages the process of learning through the acquisition of knowledge, experience and skills and the gradual intellectual and social development of the undergraduate. Where the product or content of what is being learnt is important, it is the process of learning and experience which is of greater importance to the graduating student in later life.

Traditional answers for non-completion - academic background

Traditional answers for non-completion have focused on the student's academic background and the standard of pre-Higher Education qualifications. From the literature there is no clear evidence to support the claim that poor Advanced Level GCE or BTEC ONC/HNC qualifications result in non-completion or poor academic performance at university (Chapter 5 and Sear, 1983). This is disputed by Johnes & Taylor (1990) who argue that there is a 0.98 positive significant correlation between pre-Higher Education attainment and subsequent performance at university. However, there is some doubt over the reliability of the statistical method used by Johnes & Taylor (1990) who only compared First and Upper Second class graduates with their pre-Higher

Education examination results. This analysis also excludes the study and comparison of BTEC qualifications as the research used data solely from the traditional or 'old university' sector. In conclusion, no evidence has been found to prove that the pre-Higher Education qualifications will indicate what level of attainment a student will achieve once at university.

Traditional answers for non-completion - mathematical ability

As an alternative indicator of the academically 'at risk' student, a numerical and mathematical diagnostic test was given to Level One students during the induction week of Semester One in an attempt to identify those students who may experience difficulties with the numerically based components of the degree programme. At entry, the only indictor used to judge student numerical and mathematical capability is their GCSE grade in mathematics. The minimum requirement for entry onto the degree programme is a grade 'C'. However, only 83.3% of the students studied actually possessed this level of qualification.

The results from the test identified overall weaknesses in: algebra, the use of equations, indices, logarithms and trigonometry. To analyse the test for its individual diagnostic properties and overall utility as an indicator of learning difficulties and future academic performance, the individual scores for each student were correlated against subsequent coursework and examination marks for relevant modules taken in Levels One and Two. In Semester One the module "Building Mathematics and Computing" was compared with the test results and as a result there was a weak, but positive correlation between the two scores of 0.09.

In the evaluation of the diagnostic test it was accepted that the test provided essential teaching and learning information about the students' overall knowledge of the mathematical concepts which could assist in the future planning and delivery of the module - "Building Mathematics and Computing". In terms, of an individual diagnostic tool, two points have been raised as a result of this test: (1) it is questionable whether the test actually reflects the content of the Building Mathematics taught in the Level One module and (2) on the whole the students may have learnt entirely from what

they needed to know for the module's examination by the end of the twelve weeks and as a consequence the test is an indictor of the quality of their learning over the Semester.

The Royal Society (1998) highlighted the problem of a general inadequate preparation in mathematics and sciences. The Royal Society suggests the problems caused by inadequate preparation in mathematics tends to mask the key issue - student motivation. On the whole, The Royal Society (1998) indicates that student motivation is determined largely by home background, personality, the curriculum (pre-Higher Education and at degree level), teaching style, industry links with the course of study, extra-curricular activities and work experience. This also supports the findings obtained from individual interview data analysis conducted during the process of this research.

6.4 Crisis points in learning

6.4.1 An introduction - Crisis Theory

The main aim of the Developmental or Staged Model has been to identify and graphically illustrate paths of student progression alongside the paths of underachievement and deflection. As a consequence of this, potential crisis points have been identified and plotted. The Developmental or Staged Model therefore is a sequence of stages in learning. However, not all learning is positive and of particular concern is the damaging effect of the current cycle of events in a degree programme in terms of its learning and performance of students in Higher Education.

6.4.2 Crisis Points in Learning and Intellectual Development

Tinto's model is largely based around the development of a systems based model (Tinto, 1975 & 1982). However, systems models are only concerned with the source and reason for behavioural change and not with the process or resultant actions of that change. The strength of the model created for this research, considers both the idea of crisis or the critical points of change and it also attempts to graphically illustrate and describe the unfolding nature of the change process. It can be seen from the model that crisis points or the critical points of change are largely determined by the department's teaching and learning policy and the institution's academic structures, for example, in

terms of the type and timing of its assessments and examinations. Potential crisis points are therefore cyclical and recurring events. It is important to consider how effective the current semester, assessment and examination structure is in determining continual development. In particular whether the current structure is detrimental to some students. A learning development which is driven by constant learning crises and heavy work demands may not provide a successful learning environment. Healey (1996) suggests that over reliance on the unseen examination as a main instrument for assessment, for example, can actually disadvantage some otherwise able students. A much reduced reliance on traditional examinations and an increase in a wider range of assessments may advantage more students and as a result, those students will be better motivated and perform better.

Sutherland (1996) related intellectual development to life events such as: divorce, bereavement, retirement, career change and promotion and suggests that all life crises may result in intellectual and further life-learning development. However, there is currently no empirical data to support this idea. It has been suggested that there are critical points within the student experience of studying in Higher Education that may determine the level of academic achievement and the likelihood of the student not completing his or her course.

6.4.3 The path of events - a sequence of stages in learning

In most cases, the quality of teaching and course management is directly related to learning quality. The vital stages in learning may in some cases be controlled by major academic factors: examination, coursework and dissertation assessment stages. This may have a negative effect, inducing - stress, worry, feelings of depression and guilt. In addition to this, is the negative effect of personal crises, but these are difficult to detect, often due largely to the unwillingness of the student to divulge such personal information.

6 .4.4 The cycle of potential 'at risk' - critical points

A cycle of potential 'at risk' critical points has been identified, unique to the building degree programme and this survey. The first point begins before entry onto the degree

programme and into the first or induction week of the new term/semester. Many students who leave at this point do so without even attending any part of the course - the "non-attenders". The more committed progress through to the first month. Again withdrawal can be high at this point - students leave within the first four weeks. As work begins to get underway, students are more aware of the course they are on. Some make attempts to change track if necessary and withdrawal or transfer takes place. The reasons given include: course suitability, academic difficulties, overly theoretical and too mathematical and scientific. In addition, at this point many students transfer either to another related course within the university or to a similar programme at another institution possibly closer to home. The third point comes during the examination period at the end of semester one. At this point, students do not leave, but are more susceptible to the stresses of academic life and the traditional written examination. The cycle continues through the rest of Level One and through Level Two. At this point the rate of non-completion and resit rate falls back. The next major hurdle is the Placement Year between Level Two and the final year. Many students welcome this return to study, but find it difficult to readjust to academic life after work. In addition, students also find that more is demanded of them in their final year. However, the worst case scenario tends to be only a reduction in the overall marks for the fourth semester and little or no withdrawal or transfer takes place at this point.

6.5 Inventories, tests and interviews

6.5.1 Introduction

The study began by employing a selection of methods of inquiry to investigate the problem of non-completion and underachievement, by identifying those students who are more likely to experience learning difficulties and therefore would be seen to be 'at risk' of not completing a degree programme. During the process of the initial research study it was determined that a more qualitative approach would provide more appropriate information. Traditionally, quantitative studies have dominated educational research, but recent trends point towards a more qualitative approach as a means to extract more detailed data and information which is practically applicable to problems in the real world. The first two methods of inquiry were based on (1) Perry's and Erwin's Intellectual Developmental Inventory and (2) Entwistle and Ramsden's and

Richardson's Approaches to Studying Inventory or Questionnaire. The second method involved the use of a mathematics diagnostic test. This is an example of how a specific area of the curriculum could be tested to identify those students who might experience specific learning difficulties in the area of building numeracy and mathematics.

Finally, the research study employed a comprehensive interview sampling technique to discover the qualitative determinants of underachieving and non-achieving academic performance. The interviews then formed the basis for a further development of individual student case studies. The study has further developed to employ methods of inquiry to investigate student progression and development throughout the degree programme.

6 .5.2 Intellectual Development Inventory

The Intellectual Development Inventory (IDI) used in this research is a modified version of the Erwin IDI (1981; 1983). This IDI uses 40 questions, 10 for each category: dualism, multiplism, relativism and commitment to relativism. The purpose of this revised inventory was to measure and compare the qualitative change in the students' thinking from the first to the final year. In broad terms, the results obtained from the inventories agreed with the Perry Model of undergraduate intellectual development (Figure 4). However, one of the main aims of this research project has been to identify the initiating points of student withdrawal, underachievement and failure and then to map out the pathways or processes which result in eventual drop-out, under-performance and referral. Perry identifies three points of deflection from a normal progression in his model: 'retreat', 'temporising' and 'escape'. Perry theoretically believes a student is 'at risk' when they pass through from the first or dualistic stage in development to the second or multiplistic stage. Perry further breaks this down and identifies three actual positions (2,3 and 4) where retreat, temporising and escape can occur. Theoretically it is believed that these positions occur between the start of Level One and Level Two. At this point, the student recognises how intellectually challenging the degree programme is and this can invoke an emotional crisis largely in response to the student's overwhelming lack of confidence and confusion as to what is required of him or her from the degree programme. Perry suggests that this crisis is

promoted by a sudden change in complexity of the degree curricula and to learn how to deal with this change, it is suggested that the university and its lecturing staff should be prepared to outline in more detail exactly what type of learning is required and why the student now needs to think critically. This would reassure the student who then would be more willing to readjust to a new way of working.

Theoretically, while this recognition by Perry of certain critical points of being 'at risk' is important, it is very difficult to actually pinpoint the exact moment of crisis via an inventory. The IDI used in this research does not have the precision to identify a student 'at risk'. To identify a student in difficulty would require a particular complex inventory structure and one which identifies each of the nine positions in Perry's model. In this way, positions 2, 3 and 4 could be tested for and any student scoring highly in these areas investigated further. However, the new inventory would also have to be regularly issued to the whole student body on a continuous basis in order to accurately identify where each student is on the model at any one time during the degree programme. In reality, this would be impractical and unlikely to be welcomed by many students or staff who would have to administer such a task.

6.5.3 Approaches to Studying Inventory

The Approaches to Studying Inventory (ASI) was given to all three cohorts of students during Semester One in 1995-96. The students were allowed a maximum of 40 minutes to complete the inventory. The ASI used in the study focuses on the 32 items and two sub-scales identified by Richardson (1990). This shorter inventory, as devised by Richardson, demonstrates a satisfactory level of retest reliability on both study orientations, on all eight sub scales and on most of the 32 items.

Academic performance is optimised when students accept responsibility for their own learning and success. They need to understand that effort and persistence will overcome failure. However, the centrality of the variable of locus of control is open to question. Self-control over learning is important if a student is to adopt a more desirable deep level approach to learning where the student focuses on the meaning of what is being learnt rather than a process of memory. Superficial learning strategies are

adequate for success in the school environment to such an extent that students entering university still insist on relying on the rote learning strategies. Whether they remain in this phase depends largely on the discipline being studied and the academic culture of the School or Department (Watkins, 1987).

It is predicted that an internal locus of control should be a causal factor in students becoming less reliant upon surface level strategies and the adoption of deeper level and more achievement orientated approaches to studying. American academics believe that their teaching often has little impact upon the students' locus of control. It is suggested that a study skills programme should be employed to ensure that learners recognise their own learning potential and provide themselves with an adequate repertoire of learning skills which suit the degree programme under study and the student as an individual learner (Watkins, 1987).

6 .5.4 Mathematics Diagnostic Test

The mathematical diagnostic test was given to all Level One students to diagnose individual strengths and weaknesses in the field of building numeracy and mathematics. The test was initially designed to identify specific weaknesses in areas of experience and knowledge in essential numeracy and mathematics. The main objective of the test was to identify the fundamental and common weaknesses in the students' mathematical abilities with the aim of addressing the problems and by directing the students to remedial support and in extreme cases to recommend and invoke a series of changes in the curriculum.

The test was marked, yielding an overall percentage assessment of 33.5%. The test produced two outcomes. Firstly, it was evident that many students had particular difficulties with algebra, trigonometry, logarithms and in the use of equations and indices. This problem has been accounted for in the recent dramatic changes which have taken place in the teaching of mathematics at the school level. The General Certificate in Secondary Education has shifted the emphasis to what is now taught from the more analytical and scientific and abstract concepts of mathematics in algebra towards a more practical and concrete approach through the study of shape, geometry

and statistical probability, and the concept of logarithms is rarely taught at school level. Secondly, there was little relationship between the score achieved in the test and the end of semester assessment for the module "Building mathematics and Computing". This result questions the validity of the test. It is therefore believed that the test questions may have either been too difficult or that many students actually progressed very well through the 12 weeks of the module to achieve a better than expected result.

As an indicator of student academic performance, the test failed to provide a sound mechanism by which future academic performance could be tested. The test, however, does identify those students who would benefit from remedial tuition and act a method by which future teaching quality into the teaching of building mathematics could be enhanced and developed. The use of such a test readily identifies those areas or topics which the students on any particular cohort find difficult and can consequently be diverted for remedial tuition. This type of diagnostic tool therefore may have a significant impact on teaching quality rather than as a predictor of student academic performance and therefore as an indicator of those students who may be academically 'at risk' of not completing the degree.

Implications

Unlike a mathematics or engineering degree programme, which depend upon a reasonably extensive grounding in mathematics, degrees in building require a different and less rigorous knowledge base, which includes a basic competence in: algebra, trigonometry, logarithms and the use of equations and indices.

At the *Higher Education* level it is therefore necessary to address the problem of an increasing number of students entering university poorly prepared for studying certain areas of the Building Degree Course. In order to correct these deficiencies, four areas need to be addressed in the teaching of Level One undergraduate students: (a) encouragement of a greater understanding of the basic concepts required within the construction industry (b) correction of inappropriate learning strategies adopted by some students before they arrive at university (c) focusing upon specific areas within mathematics which are crucial elements of the course (d) the reteaching of basic

concepts within the degree programme and less reliance upon the preconception that all Level One students come to university properly equipped with adequate knowledge and skills as for example in mathematics which are required for immediate progression onto a degree programme in building.

It is believed that some students may suffer, in terms of lost confidence, due to their inability to tackle the numerical components of the degree programme as well as they might have hoped. It is not suggested that a student who experiences difficulty with the mathematics component of the course will do so in such a way to be detrimental to his or her overall success on the course. In fact, it may be a small problem, such as a difficulty in coping with mathematics and the mathematically related subjects in the early stages of Level One may be *frightening* students off the degree programme unnecessarily.

The implications of this work to date raise important questions in relation to addressing learning difficulties experienced by students. In particular:

(a) in the teaching of mathematics at first year undergraduate level on vocational courses such as Building;

(b) in the redesign of a level one module which may be a crucial element in the understanding and application of mathematical concepts throughout the degree programme;

(c) in holistic planning in course design.

6.5.5 Individual Interviews and Case Studies

Semi-structured interviews were conducted during Semester B in 1995-96. A selected sample of students was taken from each year group. The students were selected for interview on the basis of the background data collected earlier in the research study from university held records on individual students. The confidentiality of all records used in this research was maintained at all times. Once the students had been

interviewed, the information was summarised, classified and categorised into more manageable sections. The data was then divided and grouped into student typologies on the basis of academic performance. This data was then added to other background data, inventory and test data to create an individual student profile or case study for selected samples of students from each of the three levels.

Section 4.9.3 categories individual student data and information obtained via interviews conducted in Semester Two in 1995-96. Each student profile or case study has been categorised under six main headings: professional cognitive, professional affective, general cognitive, general affective, background academic and background personal. A stratified sample was selected from each level and this sample was chosen by analysing the information obtained on each student prior to the main research. In the case of Level Two and Level Four, the choice of students selected for interview was made according to (a) academic performance and experience prior to studying in Higher Education and (b) academic performance at university. For Level One, results from Semester One were the only available pieces of information to indicate what level of academic attainment had been achieved at university. An equal spread was then selected, taking a student sample from each level grouped in accordance with levels of performance (i.e. 1st, 2I, 2II and 3rd or 'at risk'). Once the data (i.e. interview summaries) had been collected, it was merged with the student's corresponding background information to form a student profile or case study for each student selected. The student categories or typologies: the high flyers; the successful, average, but stable; the successful, average, but unstable and the students 'at risk' were then reanalysed.

6.6 Discussion of results

The project employed various research tools in the course of this research. Primarily, this method of inquiry sought to investigate the problem of non-completion and underachievement. Secondly, it also focused on student progression and development throughout the degree programme. Essentially, an ASI, IDI and a diagnostic mathematics test were used to identify the causes and processes behind student underachievement and voluntary withdrawal. In addition, the IDI was also used in the

study of student progression and intellectual development.

6.7 Limitations of the material presented

The process of carrying out this research project presented several problems. A fundamental problem was how to balance a quantitative approach with a qualitative one. A largely qualitative approach was considered to be more appropriate owing to the type of data and information required for the model. A second problem was the presentation and analysis of the data collected. During the analysis of the data, it was discovered that a schematic model was determined to be the best way of representing the progression of student performance through an entire degree programme.

However, for this research to be really effective, a longer time frame was required. The first year spent on this research project largely concentrated on an experiment to decide what type of questionnaires to use and what type of interviews to conduct. Ideally, this research needed to track complete cohorts of students through a whole degree programme - giving them questionnaires and interviewing them at every stage throughout the programme for each of the six semesters.

This research project is largely cross-sectional in design. This is the most common and time-saving method of research. However, future work of this type should adopt a more longitudinal approach, tracking a number of students through each year of their course, interviewing them at least twice during each year - a technique similar to Perry. A broader student population needs to be approached, taking a student sample from discipline areas such as: civil engineering, computer studies, the humanities and Law. This research project is only a small-scale investigation into a specific issue within Higher Education. A careful consideration was taken as to the type and amount of data collected. This was done, largely to avoid data overload, but also to reduce problems in the analysis of the data. A large scale survey may have been more desirable at the outset, but it was soon discovered during the first stages of the research that a smaller and more in depth, largely qualitative method was more appropriate given the nature of the project and its overriding aims and objectives within a defined time scale.

6.8 Contribution to knowledge

Primarily, an important element of the thesis is an evaluation of the importance of the research to the development of the discipline. Secondly, it is important to compare existing knowledge with the research findings that have emerged as a result of this research project such as the differences between the Focal Theory (Chapter One) and the Background Theory (Chapter Two) to the results and theoretical framework resulting from this research work (Phillips and Pugh, 1987). A final evaluation will consider the limitations of the study and of the research data presented and to place the research conducted into perspective with the entire subject area.

6.8.1 An evaluation of the importance of the thesis to the development of the discipline

In evaluating the contribution of the thesis to the discipline, and the benefit and further development of the way future Higher Education provision could be managed, this thesis, is a comprehensive study of the factors that determine academic performance in Higher Education with a particular emphasis placed on the factors which determine underachievement and non-completion due to voluntary withdrawal or academic failure. In terms of its contribution to the philosophy and the study of Higher Education, the thesis offers a new theoretical framework which describes and explains the factors, reasons and processes which result in a student's decision to leave. The theoretical framework presented relies largely on the study of the psychological aspects which determine how well a student performs in Higher Education. Earlier models (Tinto, 1975) tended to rely upon the study of the more sociological aspects which determine how a student progresses through Higher Education. This work extends the boundaries of existing knowledge in this area (i.e. the work by Tinto (1975, 1982 and 1988) and by Perry, 1970). Its main contribution, however, is the attempt to identify the student 'at risk' of not completing a degree programme. From this research, it was noted how difficult it is to quantitatively and accurately detect a student 'at risk' by the use of psychometric testing and from the information held by the university on the students' previous academic background.

The second consideration is the rationale behind the research. The research undertaken

is largely an applied research project and an investigation into the factors that determine and drive academic performance. In recent years and since the abolition of the Council for National Academic Awards (CNAA) and the creation of the 'new' universities. Opportunities have been opened up for the pursuit of in depth research into the provision of Higher Education in the UK in the wake of increased access and expansion of student numbers now entering the Higher Education sector. Since 1992 the Higher Education sector has been encouraged to consider the purpose of a higher education system and to assess the quality of teaching and learning in Higher Education - a form of quality assessment never engaged with previously. This kind of self-assessment and quality control has had various implications as to how the Higher Education sector is managed. Since 1992 there have been dramatic changes to the entire fabric of Higher Education provision in the UK. However, these changes are set to continue with the publication of the Dearing Report for Higher Education in July, 1997.

The research primarily sought to determine why withdrawal and referral on the BSc Building Technology and Management degree was higher than the national average. The purpose of this enquiry concerned itself centrally with the quality of academic delivery. Non-completion rate is seen by some as an indicator of poor teaching quality and ultimately a waste of human, social and financial resources. It is intended that this research will provide a greater understanding of the problem and identify solutions to solve it.

6.8.2. The differences between the background (existing works) and focal theory (research aims and purpose) and the results of the research work

'Background Theory' is a term used to describe the scope and value of existing works and 'Focal Theory' is a resulting theory generated from a review and analysis of existing theoretical models and accompanying literature (Phillips & Pugh, 1987). The Focal Theory then serves as a starting point for further research work and one from which emerge ideas for future research aims and objectives. This part of the research process is the most difficult, and like all planning operations, will determine the direction and eventually the overall success of the research conducted. However, like

many other research projects, the direction and purpose of the research can change as the work progresses towards its final conclusion. During the planning stage of the research programme various difficulties were encountered and had to be overcome. As a result, the actual nature of the problem and the reality of the situation began to dictate what type of research methodology should be employed and how the research project should proceed. Later literature reviews also helped to mould the research as it progressed alongside the collection and analysis of the data and information obtained as a result of the inquiry.

When considering at the differences between the Background and Focal Theory and the final research outcome, it is acknowledged how difficult it is to design and then execute a research methodology which is suitable for this type of inquiry. An inquiry based more or less entirely on the qualitative approach has been adopted, largely because it compliments the nature of the problem. The theoretical framework constructed as a result of the findings uses ideas taken from the works of Tinto (1975, 1982 & 1988) and Perry (1970), but also develops its own identity. The work by Tinto on student non-completion in the late 1970's and 1980's consisted of a largely sociological study of student withdrawal behaviour. This study deviates from that approach and relies on a more psychological study of the problem.

6.9 An overview of the Discussion Chapter

This chapter considered existing knowledge in the light of the research carried out during the process of this work. The purpose of this research has been to describe and explain specific events which both determine the level of academic performance and contribute to the cause of withdrawal and underachievement. The process of progression and retention has been illustrated and explained by the construction of a two dimensional theoretical framework which (i) maps out student progression and points of deflection and (ii) provides an idea of the type of student 'at risk' of underachievement and withdrawal.

The author determined that a qualitative method of research or the qualitative research paradigm would be adopted. Within this, it was also determined that the research study

should focus on the individual student, and to achieve this all data had to be grouped on an individual basis. To this end, data collected from interviews

The IDI created for this study from the work by Erwin (1988) produced results similar and in accordance with the work of Perry in 1970. Indeed, undergraduate students do progress from dualistic or multiplistic stages of intellectual development through to relativism and commitment to relativism. However, this form of intellectual progression and development cannot be identified for all students. Information obtained via semi-structured interviews indicates that it is possible for some students to pass through a degree programme without experiencing any marked change in intellectual development. This may reinforce the idea that Perry's model is both idealistic and theoretical. For example, a student may be able to operate at all stages of development at any one time throughout the three years at university. If a student perceives that a dualistic strategy will gain them better marks from an individual member of staff as opposed to another, they will think and perform accordingly. This suggests that Perry's scheme is not totally accurate and that intellectual development needs to be controlled and steered by the educational environment of the degree programme and the discipline under study. However, certain disciplines (such as science and technology) may not require deep modes of learning or a great deal of critical thinking and analysis. In this case it is debatable whether this type of development actually takes place. Perry (1970) also suggested that students can deflect from a normal line of progression during Positions 2, 3 and 4 - between the dualistic and multiplistic stages of development. However, the IDI fails to precisely pin-point the critical point of this deflection and therefore the actual point of risk.

Chapter 7. Changes in Teaching and Learning Strategy

7.1. Introduction

The research data and documentation used in this research is confined to a specific degree programme - the BSc (Honours) degree in Building Technology and Management, but the implications for this research for other degree programmes within the Built Environment which are multi-disciplinary and pluralistic in content are evident. This is underlined in a current trend by the Higher Education funding councils to direct funding towards more discipline based networks which aim to enhance and promote good practice in teaching and learning (Healey, 1996).

7.1.1 A question of output standards and the problem of poor numeracy and mathematical skills

The importance of identifying and attempting to improve numeracy amongst students while at university has become more important in recent years as the discussion of input (pre-entry qualifications) versus output standards (undergraduate and postgraduate degrees) fails to reach an adequate conclusion with regard to later professional accreditation. This is exempted with the current situation regarding to SARTOR (Standards and Entry to Registration) amongst the engineering professions. The Association of Graduate Recruiters has stated that many graduates lack many of the 'soft skills', including important numerical skills (Daily Telegraph, 1998). A good degree - for example, an upper second class - may not equate to proficient numerical skills in some cases and employers are becoming increasingly aware of this. This problem has been identified and is more of a problem in subject areas such as information technology, food science, chemistry and the engineering specialisms such as electrical and electronic engineering, but the principle may be equally applicable to degree causes in the Built Environment. The highlighting of this problem only serves to reinforce the need for dealing with it by providing greater assistance in the

teaching and learning of the numerical skills required by building graduates.

7.2 Individual problems

7.2.1 Dealing with the problem of inappropriate educational background

Many students now enrolling onto the Building Technology and Management degree programme do not possess a pre-Higher Education qualification in an appropriate subject (e.g. a BTEC in Building Studies, Construction or Advanced Level GCE's in the science subjects). Many seem to be coming from humanities backgrounds with subject areas such as Psychology, English and History. This presents problems of academic orientation and adjustment to studying in a new area. This places extra pressure on the student who needs to rapidly acquire new skills and knowledge. However, many of the students interviewed did stress that they were aware of the practical side of the construction industry and many had some experience of building which may alleviate some of the pressure by introducing enthusiasm, interest and motivation drawn from experience.

From an academic perspective, if a student chooses to study in an area or domain in which he or she has not studied before, it may be reasonable to assume that that student may not be at the formal operational level required for the degree programme and therefore not capable of operating at the level of abstraction required by this 'new' programme of study (Sutherland, 1996). The student who progresses from a different academic background (e.g. humanities) onto a degree programme totally different from the previous course of study (e.g. a degree in building) may need extra tuition to establish a grounding and level of intellectual processing at a concrete operational level before rapidly progressing to a higher, formal or abstract operational level of thinking. The theory of intellectual development (presented by Piaget) seems to support the need for a greater level of foundation type of teaching during the first phase of a degree programme, especially on degree programmes which attract a large number of students from different or only slightly related academic backgrounds. This need is highlighted by foreign students who are studying in the United Kingdom for the first time. Differences in culture, language and

academic background need to be recognised and addressed and staff need to raise their awareness of these differences.

7.2.2 The problems associated with teaching building numeracy and mathematics

From the outset of the research project, many lecturers and experts in Educational Development who had previous dealings with the School of the Built Environment (now School of Technology - Division of the Built Environment) and in particular the Building degree, felt that many students were experiencing learning difficulties with the numerical and mathematical component of the course. In order to address these problems, individual staff members may need to develop a greater understanding of educational theory and some of the reasons for this problem may be explained from a theoretical perspective. Piaget's theory on intellectual development could be especially applicable to describing how students on the Building Technology and Management degree programme could be persuaded to approach, understand and learn the mathematical concepts required by the course. Piaget describes a concrete operational stage which is similar to a more practical and vocational approach to learning and competence. The higher order, formal or abstract operational stages in Piaget's model are more 'academic' and less practically based. From the research undertaken to study learning difficulties with building mathematics one problem highlighted in this study was a difficulty some students had with algebra and trigonometry. Algebra and trigonometry tend to be abstract concepts in mathematics and not the easiest to understand.

The numerical and mathematical content of the degree programme was also thought by many to have been taught too fast. To many students it was apparent that even though the lecturers teaching the course knew the subject well, they did not make any allowances for those students who struggle with the mathematical component.

The problem of missing algebra has been highlighted further and the blame for this problem has been attributed to most aspects of the educational system, including: mathematics

teaching in schools; the National Curriculum; teacher training; text books and new forms of assessment (Royal Society, 1997). The National Curriculum has been criticised for being generally too unspecific and more importantly, lacking algebra in its content. The algebra component needs to be expanded and elucidated and it has been recommended by the Royal Society that a critical reappraisal is made on the notions on which the National Curriculum is currently appreciated. The Royal Society has highlighted the need to encourage the use of a clear and coherent algebra curriculum at GCSE and GNVQ levels. To criticise mathematics for being too abstract is a mistake. It is this abstraction which makes mathematics useful in certain practical applications. Special consideration should be made to what type of algebraic work is required in the context of vocational employment and for the study of science, technology and engineering based degree programmes.

7.3 Changes to the teaching and learning strategy?

7.3.1 A change in everyday teaching methods?

It could be debated that the main purpose of *higher education* is to promote the development of intellect, by the way of carefully constructed teaching and learning programmes. The Educational Development experts in the UK advocate the reduction in the use of the traditional 60 minute lecture as a teaching method and the reduction in the use of the traditional 180 minute written examination as a form of undergraduate assessment in place of more creative use of innovative teaching, learning and assessment methods. It is interesting to consider how the educational environment has changed in Higher Education in recent years. It has taken an external change in the Higher Education system to provide the much needed stimuli for many academics to reconsider and change the balance of teaching and learning methods used (Healey, 1996).

7.3.2 Innovation in teaching method

One of the most notable teaching and learning problems encountered in this study, was the type of learning difficulties experienced by some students with regard to basic numeracy and mathematics. Many students appear to be competent in the use of numbers, some have

already identified and addressed the problem themselves prior to coming onto the degree, but others (a minority) do suffer from some degree of learning difficulty. It is suggested, that the school may consider Supplemental Instruction or (SI) or Graduate Teaching Assistants (postgraduate research students) as a method of teaching or supporting the tuition of those students who could be 'at risk' from experiencing learning difficulties in this area.

7.4 A change in assessment procedures, type and timing?

7.4.1 The quality of teaching?

The main responsibility for improving academic performance and therefore the reduction of student underachievement and ultimately wastage, lies firmly on the shoulders of each school or department. Three important factors have been recognised in the last few years which indicate the level of quality in teaching in Higher Education. (1) Value Added Higher Education: the extent to which the levels of achievement are improved as a result of the experience of the course (Healey, 1996). (2) Customer or Student Satisfaction: the extent to which the degree programme meets the needs of the student; the extent to which the student meets the needs and requirements of the employers, professional bodies and society (Healey, 1996). Indeed, student satisfaction and its relationship to student withdrawal has been studied in depth by Thomas et al (1996) at the University of Wales Institute at Cardiff. A main cause of withdrawal was found to be a dissatisfaction with the course of study and/or the potential career opportunities open to the student resulting from the successful completion of the degree programme. Thomas et al (1996) also suggests that a more reliable and effective admissions procedure and an improved available, accurate and honest information facility on the course content and related careers should be available to students at entry. However, Thomas et al (1996) conclude from their study that there is no clear difference between the level of satisfaction or dissatisfaction, and the reasons given for withdrawal and those levels of satisfaction or dissatisfaction given by those students who do not withdraw. The reasons for this, is that the students who do not leave are more able to cope with their situation or are less likely to complain. While the students who withdraw

have nothing to lose and are therefore more determined not to put up with a situation they find to be unsuitable or unsatisfactory. (3) Finally, the Percentage of Students who leave the Degree Programme (i.e. withdrawal, transfer and referral).

The primary aim of any school and therefore the institution is to be continually enhancing its teaching quality in terms of its delivery and content. The quality of teaching and learning therefore is dependent upon successful course planning, effective and dedicated teaching staff and the development of a sound research base which contributes to the quality and up-to-dateness of the material being studied by the student. It is proposed that greater efforts could be made to achieve two important goals: Firstly, providing a Value Added Higher Education system which incorporates degree programmes which promote and encourage the highest student achievement and therefore ensures that as many students as possible successfully complete the course and achieve the highest possible classification. Secondly, further consideration could be made to ensure the highest level of customer care or pastoral care is provided. To achieve this aim, a greater emphasis needs to be placed on: (a) Providing a better system of pastoral care, such as a traditional tutorial system and the promotion of improved social integration within the School of the Built Environment (now School of Technology - Division of the Built Environment), (b) a degree programme must fulfil the needs of all the stakeholders in Higher Education (students, employers and professional bodies).

A vocational course, such as the BSc degree in Building Technology and Management, exempts a graduating student from the professional written examinations of such professional organisations as: the Chartered Institution of Building and the Association of Building Engineers. Professional accreditation of vocational degree programmes such as this helps to underpin both a high academic and professional standard. This ensures that the degree programme maintains an acceptable all round academic and professional standard and at the same time brings about the necessity for effective teaching and the continuing provision of the best possible learning environment.

However, the learning environment must suit the student body. It is noted that with each passing cohort comes a change in the make-up of student body passing through the degree programme for that year. To reduce non-competition, it may be necessary to assess each cohort at entry by studying the data available at intake and by developing and employing some kind of improved diagnostic assessment to reveal and remedy any weaknesses and shortcomings which may exist within each cohort.

It is also recommend that a reduction in the weighting for examinations could be made from a current 65-60% to 55-50%.

7 .4.2 Continuous or formative assessment?

The most obvious predictor and indicator of a student's academic achievement, or even psychological risk factors must be through the use of continuous assessment. The Geography Department at the University of Aberdeen, headed by Professor Keith Chapman, utilises a computer-assisted self-assessment system throughout the degree programme which allows those students 'at risk' to be identified quickly by tutors. In this way, a failing or potentially failing student can be identified and action to remedy this can be taken to reduce the damaging effects of underachievement and eventually failure. A self-assessment/continuous assessment regime or early warning system like this needs to be operated in parallel to existing assessment methods to ensure academic rigour. However, this needs to be carefully considered as it could place an extra burden on the existing assessment and general teaching and administration system.

7 .4.3 The structure and organisation of the degree programme

The bunching of assignments towards the end of each semester could be reduced with careful planning. The overall day-to-day organisation of the degree programme in this regard has been criticised by some students.

7 .4.4 Semesterisation - a misguided concept?

Semesterisation is an American Higher Education sector teaching structure which

comprises two semesters per year - a total of six semesters are taken for a degree programme. Semesterisation was also introduced into the British system in 1991 and superimposed upon the existing three-term structure. The impact of Semesterisation has been studied in the course of this research study. Semesterisation creates extra 'crisis points' - the occurrence of examination periods is doubled. Many Educational Developers believe that the traditional examination is over-relied upon and for some discipline areas it could be considerably reduced. Semesterisation is also superimposed upon the existing three-term structure (autumn, spring and summer, or as in Oxbridge Michaelmas, Hilary and Trinity). As a result, time is wasted and misappropriated within the year programme for both students and lecturing staff. The abandonment of Semesterisation will potentially free-up time during Semester A which is currently used for examination purposes which could be more appropriately used by staff for pastoral care, teaching quality assessment and curriculum development. The traditional time for the unseen, written examination is in May and June after this time the students have left the University for the summer vacations and it is a time when student-to-tutor contact is at a minimum. The Semester system interferes with the traditional and natural progression of a degree programme and consequently its overall benefit to the student at and after graduation. Unless moves are taken to reconstruct the academic year it is difficult to reconcile the concurrent operation of two systems (Semesterisation and the traditional academic system based on the timing of Christian festivals, i.e. Christmas and Easter) successfully. The Building degree is also an integrated professional degree programme which must remain within a set standard which is professionally accredited bodies. The University of Glamorgan recognises the intellectual and personal development as being the central aim of a degree programme in Higher Education. It is argued here that Semesterisation actually harms intellectual progression in a number of ways: it wastes limited time, it exposes the student to too many examinations and it may be placing too much pressure on both students and lecturers in terms of time and stress. It is proposed that the institution should proceed with the abandonment of Semesterisation in favour of the traditional three-term system and in this way free-up time which could be better used in terms of the provision of improved pastoral care, the promotion and encouragement of better professional reflection into teaching practice and

increased effort in research (discipline specific - specialist research work and teaching and learning) which in the long run may increase teaching quality, and not reduce it.

7.4.5 The variations and mode of teaching

The prime objective of a *higher education,* as set out by the Teaching & Learning Strategy for the University of Glamorgan, is to promote and encourage personal and intellectual development. To achieve this objective the student must be made aware of the purposes of higher education. However, as major stake holders in Higher Education, there is a question of how much control should students have over their own learning environment? It is agreed that all students should be encouraged to have some input into their own teaching and learning, and in some cases, some control over the institution's decision and policy making process. Each degree programme needs to be structured in such a way which promotes: student learning, the acquisition of transferable skills, the motivation to keep going and ultimately the promotion of gradual intellectual and social development which signifies the purpose of a *higher education* for the next millennium. This could be achieved by placing greater emphasis on the importance of continuously discussing with students matters relating to their own personal and intellectual development as undergraduates in accordance with the ideas presented by Perry (1970).

To achieve this objective, greater efforts need to be made to apply to all that is known about student motivation and commitment in the development of individual degree programmes, modules, assignments and extra curricular activities which promote student social and academic integration. A better explanation needs to be given to the students as to why they are undertaking this type of study, what it entails and what stages of development they will attain as they progress through the course. The student needs to be made aware of this discovery as early as possible and this could be explained alongside the possible educational aims and degree programme objectives. This could be set out during each school or departmental induction session and then reinforced at appropriate stages during the students' progression through the degree programme. In addition, the structure of the teaching and learning and the assessment regime should also reflect and promote awareness

of the main aims and objectives of the degree programme. To develop student motivation, regular formative assessment with detailed, positive and constructive feedback could be an option. Increased involvement between staff members and students should also be encouraged as an active part in the development of the teaching and learning process.

7 .4.6 Course content, the learning process and course structure

Three important factors have been considered as a part of this research: course content (i.e. the multi-disciplinary nature of the programme), the learning process - intellectual development, the acquisition of knowledge and skills, the provision of a Value Added Higher Education and improvement of customer/student satisfaction and the degree programme structure (i.e. the avoidance of work-over-load and a balanced structure of assessment in the timing of submission dates).

The content of the degree programme is broadly set out in the University prospectus and as a consequence it is the main source of information on which all students initially based their decisions to enrol on the course. The findings of this research have suggested that the main reason for early withdrawal from the degree programme arises due to poor decision making on the part of the student at the outset. To reduce this kind of wastage, efforts need to be made during the 'selection' and admissions phase of the process to ensure that the right student embarks upon the degree programme and that every student is made fully aware of what the degree aims to do, what it entails and what kind of learning it strives to achieve. However, it is admitted that there are no easy and fool-proof methods of admission that would completely eliminate this type of withdrawal. The learning process and the promotion of the personal, intellectual and social development of all students through the provision of the best possible teaching and learning environment is dependent upon the longitudinal structure of the entire degree programme. In theory, and according to Perry, intellectual and social development should progress as the student proceeds through the degree programme. The principle is that development starts with a dualistic or multiplistic stage and moves through to stages of relativism and commitment to relativism. Evidence from this research study lends support to the claim made by Perry in 1970 that

undergraduates generally follow a developmental path similar to the scheme of development first proposed by Perry. The promotion of intellectual and academic development, however, is the sole responsibility of the teaching department or school.

Ahmed et al (1997) in their paper presented at the "2nd Working Conference on Engineering Education" at Sheffield Hallam University in March 1997, argue that it should be the future task of all educators in Higher Education to recognise that students are individuals who learn in a variety of different ways. Ahmed et al (1997) notes two main cognitive styles: Kolb (1984) and Riding (1996). Kolb established four learning styles (convergers, divergers, assimilators and accommodators) and concluded that civil engineers are predominately 'convergers'. The alternative approach by Riding (1996) illustrates two basic cognitive styles: the holist-analytic (the student who takes a whole view approach or sees things in parts) and the verbal-imagery (the student who is more verbal and thinks in terms of mental pictures or images). Ahmed et al (1997) also pointed out that the converger element in Kolb's learning styles matches with Riding's description of analytic-imagery. In a similar manner, holist-verbalisers compare to Kolb's 'divergers'. Kolb notes that convergers are usually outgoing, reflective, independent, deep in their approach to learning and able to form abstract concepts. In contrast, divergers exhibit the opposite characteristics. An important point to note here, is that in recent years, the degree course in Building Technology and Management has seen an increase in the number of students entering the course programme from the humanities. It is reasonable to assume, therefore, that these students (even though they sometimes have a good grounding in the practical aspects of building) may possess the wrong learning style.

7 .4.7 The Quality of Degrees

The quality of degrees obtained by students has increased in recent years across the Higher Education sector in the UK. This improvement has been accounted for, not in a decline in the standard of a British degree, but in the lowering of expectations; expectations of undergraduates were previously too high; the students are better prepared generally than before; the students are better motivated. The job market has become more competitive

since the late 1990s and overall, the teaching in Higher Education has improved. However, it is the change in the mode of assessment which, it is thought, has resulted in an overall increase in student academic performance (Healey, 1996). It is also suggested that a gradual decline in the reliance of the unseen examination as a dominant instrument of assessment and a corresponding increase in a wider range of assessment methods, has advantaged more students than it has disadvantaged and as a consequence more students are now crossing the lower and upper second class divide (Healey, 1996).

7.5 Approaches to tackling non-completion

A long-term commitment is needed to make the total university environment a setting for the promotion of a better understanding of individual student development (Parker, 1978). The existence of this new developmental sequence may have some bearing on future course structuring, tutorial groupings, initial student selection and pastoral care. Groupings of students of a similar typology could point towards ways of identifying and supporting students who are the most vulnerable to the shock generated by the transition from work to university or from school to university. As a result of this work, *critical points* and reasons for academic decline have been identified and the *critical process* has been researched in an attempt to identify the type of student 'at risk'.

7.5.1 The admissions process

It has been argued earlier in the work that the admissions process plays an important part in determining the proportion of student who leave during the early phase of the degree programme. This section of the chapter, seeks to expand and highlight some of the changes that could be taken into consideration when interviewing and admitting students onto the degree programme.

Wilkinson et al (1997) attempted to identify the point of selection where students are more likely to withdraw or fail. Wilkinson et al (1997) identified several reasons for 'failure': the academically weak, those students who lack the necessary motivation and a number of

other non-academic related factors such as financial difficulties. In this paper, Wilkinson et al (1997) highlighted the level of concern in Higher Education over the numbers of students who do not complete their degree programmes and how the way prospective students are selected. Wilkinson et al (1997) also suggested that there is a growing need to carefully select students not only for their suitability to the degree programme in question, but also on the indications they give that they will complete the course.

Some recommendations for selection and admission

- consideration of the problem at the departmental or school level;
- honest 'selection' procedure on both sides: the institution and the student;
- greater details of the degree programme to be circulated to prospective students;
- greater effort to provide Level One students with university accommodation or private accommodation near to the university.

HEFCE Part 2 (1997) suggests that non-completion is a result of the social process between the student and the institution (preparedness and student to institution compatibility). This interpretation is not dissimilar from Tinto's theory. However, the HEFCE report suggests that a better management of the process of social integration could improve retention. This could be achieved by providing more information to students with regard to degree programmes and in the increased responsiveness of staff - academic and non-academic.

7.6 The Induction Process

7.6.1 Departmental Induction

Decisions made at the selection stage may be important and every care should be taken (a) to provide additional foundation-type introduction at the start of the course and (b) to provide better study skills and pastoral support during the students' time at university. American attempts to address the problem of student withdrawal during the first period, include: continuous induction or social and academic integration throughout the first semester and beyond the first week.

7.6.2 Solutions for reducing non-completion

It is difficult to clearly identify the student who is 'at risk' from data collected at entry. It is also difficult to identify the student 'at risk' from a one-off diagnostic test. It has been suggested by HECFE (1997) that some sort of early warning system is needed in the form of formative assessments which are designed to identify academic weaknesses. This research concludes that continuous formative assessment is the academic answer to the problem, but it must be stressed that part of the problem lies with individual problems which are quantitatively unidentifiable. It is therefore suggested that each student must be asked to attend a compulsory interview, at least once a semester.

Student Profiling

It is also recommended that there may be a need for better student profiling - i.e. closer examination of entry qualifications and previous experience. In some cases, previous academic and practical experience may be seen as an indicator of future ability, but it must not be taken as a guarantee of it. This is not to say that the student may be giving a false impression to the university, but it highlights a need for care to be taken by members of admissions staff who need to be more responsive to individual student strengths and weaknesses, especially when those weaknesses are more acute (e.g. through dyslexia, general learning difficulties and deficient study skills).

Formative assessment and diagnostic testing

The HEFCE (1997) report advocates the use of more formative assessment, especially in Level One. General formative assessment could act as an early indicator of the student 'at risk'. Continuous assessment of this type immediately identifies the student who has already withdrawn (some students disappear without informing the institution of their departure), the student who may be absent from a large part of the course, and the student who is genuinely experiencing learning difficulties, but is good at covering up the problem.

Personal interviews

Personal interviews could be used on a confidential, one-to-one basis which gives the

Personal Tutor and the individual student a chance to create a working relationship with the student and one which can be used as a *qualitative* means of identifying the student academically 'at risk'. During the process of this research, a number of key factors have been drawn from data collected which explain, in part, why some students are 'at risk' of not completing their degree. This includes: poor motivation, career aspirations, commitment to a goal; academic and/or career, coursework stress - spending too much time in proportion to what the assessment is worth; total workload stress or a general lack of confidence; alternative academic backgrounds (i.e. psychology, history); immaturity/personality clashes with students and staff (although this is a minor problem); poor examination preparation and technique, mathematical/numerical incompetence, no private study undertaken (this mainly applies to Level One); earning money versus studying dilemma and problems with residence during term-time. Alternatively, some students may not actually be 'at risk' of non-completion, but they might have erratic academic performance profiles and therefore might not be performing at their full potential. These students tend to lack the appropriate level of intellectual development. Consequently, such a student finds the assessments too vague the lectures boring and hence difficult to concentrate only works at examination time and tends to be a surface or strategic learner. These factors are seen as the unmeasurable causes of poor academic performance and non-completion and therefore the kind of behavioural characteristics which a personal tutor could look for.

7 .6.3 Induction Interviews

It is proposed that each student should be offered an interview at the start of every year or new level. This interview should last for about 15 minutes and serve the following functions:

- to create an environment in which the student feels he/she can present staff with individual academic problems;
- to provide continual personal support;
- to assess the student's current position in terms of academic progress;

- to increase and inspire motivation through identifying the student's weaknesses and strengths (these may change over time and throughout the course);
- to highlight and explain what is expected in the next level.

In conclusion, the problem of non-completion could be addressed by:

(1) student profiling at entry,
(2) diagnostic testing of elements of a degree programme that tend to prove difficult for most students (e.g. building mathematics),
(3) setting out the background of the course programme and continuous formative assessment and
(4) by conducting personal interviews throughout their academic career.

7.7 The encouragement of motivation

7.7.1 Pastoral Care

Attempts need to be made to make available time for academic staff to invest more input to pastoral care and academic direction and support. Staff need to be encouraged to be supportive and sympathetic to the needs of students in general. However, this is even more important when providing comments to assignments. The encouragement of a supportive and sympathetic approach when giving feedback can only serve to promote and increase the student's motivation to learn.

7.7.2 Supply of assistance and possible transfer information

It is recommended that students considered to be 'at risk' should be offered information on:

- the services offered by the University's 'drop-in' centre;
- transfer procedures - if the student expresses any kind of dissatisfaction about the degree programme;
- more supportive and informed referral procedures.

Chapter 8. A Critical Review of the Research

8.1 Introduction

This chapter addresses:

(i) a critical review and justification of the research methodology adopted;

(ii) a critical overview of the research work completed and the problems encountered and finally

(iii) proposals for further research.

8.2 Justification of the research methodology - a critical review

a qualitative paradigm shift in educational (Higher Education), social sciences and psychological research?

During the first phase of the research, a literature search was conducted with the aim of informing the researcher as to the direction and nature of the research project. This literature review covered four main areas of interest: (i) student non-completion (ii) existing theories relating to student non-completion (iii) various research tools applicable to this type of research inquiry and (iv) the psychological aspects of academic performance, progression and non-completion. Many existing research papers have used quantitative surveys to study student non-completion (Wankowski & Prince, 1969; Cox, 1971; MacKintosh, 1971; Wankowski & Cox, 1973; Rump & Greet, 1975). More importantly, the works studied served as a source of information from which key factors could be distilled which are seen as the prime reasons which determine student academic performance. In

particular, part of the literature reviewed outlined two existing models: Tinto's model on student non-completion and Perry's model or scheme on student intellectual development. Both theoretical and conceptual models have been referred to in this research as sources of inspiration for the development of a further model on student progression and retention. The remaining literature review considered various research methods which could be employed to collect and interpret data which could indicate future academic performance and predict which students may be academically 'at risk'. This could generate information which could be used to create a new developmental model on student learning in Higher Education.

A research plan was devised and a series of research methods employed and tested. Initially, it was realised that existing works on student academic performance and non-completion had previously depended upon quantitative methods of inquiry. In order to create a different dimension to this type of study, it was decided that a phenomenological research approach or an interpretivist paradigm (qualitative perspective) may be an alternative approach to existing research outcomes. In order to probe into the more individual perspective of academic performance and retention, written documentation, statistical data and interview techniques were seen as an alternative method which might shed greater light on the problem of student underachievement and non-completion in Higher Education. This type of approach was first suggested by Leitch (1994) who thought that a more qualitative approach and the adoption of a new theoretical qualitative framework and a more rigorous qualitative methodology might be more successful in illuminating the process of progression and intellectual development and identify the reasons for underachievement, referral and non-completion in Higher Education. Elkeland & Manger (1992) also suggested that a future research project would be better served if it studied students at different stages of the degree programme. The study of human behaviour, in general, makes it necessary to describe the student population under study in detail and in this case a qualitative data analysis is more appropriate given the nature of this research.

Ideally, a research project of this nature should seek to follow a longitudinal or cohort method of inquiry where the progression of the subjects studied is followed from enrolment to graduation. However, due to the time constraint placed on the research project only a cross-sectional analysis has been performed. As a result, this research addresses student progression level by level. Any further study of this type would require a research method which employs a longitudinal or cohort method of inquiry. This research study also used data and information from three cohorts on a single degree programme. This naturally placed a limit on the size of sample potentially available for study. Nevertheless, the research in question has focussed on a study of student behaviour which needs to study students on an individual basis.

In theory, the researcher had complete access to all students studying for the degree at any one time. However, in practice this was impossible to achieve. A proportion of the student population failed to turn-up at the sessions where inventories and diagnostic tests were issued. A further problem was encountered during the interview stage of the research. The study used a stratified sampling strategy and the students selected for interview were chosen on the basis of the information and data collected in the early stages of the research. The interviews for Level Two and Level Four (the final year) progressed well as planned, but for Level One students there was a problem. Almost 80% of those selected for interview failed to turn-up for their allotted interview session. To solve this problem, the missing students were reapproached and extra students were also selected as reserves. The second session of interviews was set and proceeded without further problems. It is possible the students in Level One were apprehensive about the purpose of the interviews.

8.3 A critical overview of the theoretical framework

The aim of the research was to construct a multi-causal or eclectic model of academic performance; essentially a study of student progression, development and retention. As with most theoretical models it is impossible to present all the information and supporting evidence within the actual presentation of the theoretical framework. The theoretical

framework, by its very nature, is a complex and eclectic model. However, the purpose of the model has been to provide a framework which identifies negative and positive aspects of the course of progression and the various critical points or points of potential academic crisis and therefore the points of deflection (referral or non-completion). The theoretical framework or model, largely addresses academic crises, and as a whole, tends to disregard the personal aspect of the student experience. It must be noted that there is growing concern over individual learning difficulties and poor student mental health in Higher Education and the impacts this has upon the student experience of learning, and subsequent academic performance. This aspect, which may in some cases influence student academic performance, was reviewed as part of an earlier literature search, but it was not pursued any further from this point as it was felt that this type of study deserved its own focus within a separate study. The focus chosen was made largely because of the sensitive nature of the personal issues which would be involved with such a study. The personal life of a student cannot be controlled by the institution, but the institution, and in particular the individual teaching departments, have a responsibility to ensure that the structure and delivery of a degree programme promotes effective learning and does not hinder it. This point brings into play the notion than teaching quality is becoming increasingly important over time. It is argued that the degree programme and the structure of the degree programme should be managed in such a way that it promotes effective learning and this involves raising the awareness of those factors which both promote and enhance learning, and detract from it.

In terms of a critical analysis of the theoretical framework, it is noted that the model is a schematic progressive framework which identifies academic crises and largely disregards the personal aspects of individual learning. This focus is supported by the various reasons offered to the university for student withdrawal from the degree programme which tend to point to academic and learning difficulties rather than personal ones.

8.4 A critical overview of the research work completed

Owing to the wide diversity of factors which determine the student experience, the area of study was focused onto the academic and institutional factors which influence academic performance in Higher Education. However, a study of this nature will tend to blame student non-completion onto the institution. It must be stressed that this is not always the case. The primary reason the study was focused in this way was that the time constraint of the research project in contrast with the extensive study of student experience and student academic performance in Higher Education which would involve a vast research study over many years. It is also unfeasible to successfully conduct such a research project owing to the nature and complexity of the interaction between the factors which determine student success or failure.

Student confidentiality

The problem of student confidentiality provided many problems which had to be overcome. All data was collected and stored in a database under individual student codes. Each student was assigned a number code so that no data was held which could be directly traced back to the individual.

Missing data - validity of data

The validity of the interviews is reliant upon the student's interpretation and response to the question being posed. Some students freely give the information honestly, whereas other students may respond in a way they believe they ought to. Any personal bias or inference on the part of the researcher must be eliminated if the data is to remain objective.

Prejudgment

Where every effort was made not to prejudge the research outcomes; prejudgment is difficult to be avoided during the planning stage of the research project from acquaintance with the research literature. The interviews conducted were of a semi-structured nature. In order to addresses specific issues during the interview, a loose structure of questioning was

adhered to, and this by its nature, determined how the research analysis would ultimately be structured.

The problem of control

It would have been unethical to use a split-level research design for this work and it was determined from the outset that no attempt would be made to disturb the natural course of student progression by introducing a strategy for improvement of one set of students which could then be compared to another set of students who had not experienced any assistance with their learning. An alternative to this type of study would be to introduce some kind of improvement to the degree programme and then to monitor and evaluate changes in student academic performance before and after its implementation.

8.5 Further work

8.5.1 A search for an alternative predictor of students 'at risk'

The research failed to present a method for predicting the student academically 'at risk'. The traditional method of future academic prediction has always been based upon the grades obtained from entry qualifications, but increasing evidence indicates that this form of selection may be inaccurate and unreliable. In terms of employing psychometric tests, the ASI is universally renown for its unsuitability as a predictor of future student academic performance and therefore the student academically 'at risk'. The outcome of this research indicates that 'motivation' and 'commitment' may be the two most important factors or indicators of successful academic performance. Any further, quantitative or psychometric form of testing would need to focus on the measurement and identification of these two factors.

8.5.2 An alternative set of aims and objectives for future work

A full review of this research project has highlighted an alternative approach to further work which could be carried out in the future. A new set of research aims and objectives is outlined below:

- an investigation into the causes of student non-completion through the use of a case study at an institutional level or between three contrasting institutions;
- greater emphasis on qualitative methods of data collection via interviews;
- complete a three year tracking programme between three contrasting course types;
- high-profile work to advise university policy makers, and
- to approach recent graduates with the aim of constructing individual profiles based on all aspects of academic progression with willing and honest individuals.

Chapter 9. Conclusions

9.1 Introduction

The purpose of this chapter will be to conclude this thesis by drawing together the main findings of the research and by reviewing what has been achieved.

9.1.1 The aims and objectives of Higher Education in the 1990's

The ultimate aim of any university is to be not only cost effective, but effective in all aspects of its provision. In order to achieve this aim, the university must make an effort to reduce the numbers it loses as a result of withdrawal. In terms of academic performance, the university's primary aim must be two fold (a) to produce employable graduates and (b) to maximise the number of students graduating with good degrees. The evidence from Terenzini & Pascarella (1994) suggests that real quality in undergraduate education resides more in the university's educational climate than with the ability of the student and what happens to a student after arrival on campus makes a markedly greater difference in the type of learning those students achieve.

However, quality in student learning may be a more important aspect of the educational process than more academic performance in terms of assessment grades and degree classification. The type and quality of teaching and the actual quality of learning and the learning processes which take place are more important than the final degree result. It is this factor which signifies the value added aspect of Higher Education provision. In the past, too much emphasis has been placed on assessment driven learning with less regard for learning and the educational process. It must be remembered, that a *higher education* should ultimately provide the graduate with learning and applicable intellectual skills which will be transferable to his/her future career.

9.2 The research project

9.2.1 Introduction

The causes of academic achievement have concerned researchers in education for many decades since a detailed knowledge of the determinants of academic performance can be used in the further development of remedial action and additional pastoral care that could serve to enhance educational development and learning improvement in Higher Education (Van Overwalle, 1989). As an extension to this, the research was also designed to focus on the problem of non-completion. Therefore this work has set its focus within a particularly complex area of research; the study of a very important contemporary issue in Higher Education. The factors, and the interactions between factors which determine student academic performance at undergraduate level are by their very nature diverse and complex. Therefore, no single factor or group of factors can be called upon to describe and explain why a student academically achieves, or why a student fails to complete a degree programme. In order to control the research, it was necessary to concentrate on factors which, as a result of the literature review, were seen by the researcher to hold specific reference and importance to the body of students studied as part of this work.

9.2.2 The research method

Two important features of this work distinguish it from previous studies. Firstly, a more qualitative approach was adopted an an alternative to the more traditional and scientific quantitative research method. The reason for this is supported by the work of Leitch (1994) which suggested that future research work in this area would be better served if a more qualitative approach was adopted which could be designed to identify patterns in behaviour among the academically weak and 'at risk' students. Secondly, a multi-disciplinary approach was adopted, but one which had a shift in focus from the sociological perspective of the problem (as seen by Tinto, 1978; 1982 & 1988) to a more educational and psychological perspective.

9.2.3 The theoretical framework

It was discovered that previous models and theoretical frameworks (Tinto, 1978; 1982 & Perry, 1970) failed to accurately pin-point the time and seriousness of intent of

student withdrawal. This research project has attempted to further refine and develop the work by Perry and Tinto to create a clearer model of student learning progression and development. The model generated in this study also provides a conceptual framework on the dynamics involved in student withdrawal and non-completion.

The model presented as a result of this research maps out a longitudinal theoretical framework of undergraduate progression and retention in Higher Education. As a result, it successfully describes and explains the critical 'pathways' students take as they progress through the degree programme. Attempts have also been made to identify the various stages or phases students go through as they either progress successfully through the degree and the critical points (positive and negative) associated with those stages or phases which indicate potential crisis points and the main points of potential risk which therefore result in deflection or withdrawal.

Although, the research project, does not identify a mechanism which could be implemented to indicate which students could be, or could become, academically 'at risk', it did describe potential withdrawal and critical (stress) points at which students are at their most vulnerable. As a result, this awareness could be used to inform key members of staff about the provision of pastoral care which can be more focussed and strategically implemented. Moreover it does offer a new direction for further work on student non-completion which is focused on the development of an early warning system which uses catastrophe theory to assist in the identification of the student 'at risk'.

9.2.4 Withdrawal and non-completion

The most notable finding from this research is that a majority of withdrawal (around 9.67%) occurs within the first few months of attendance at university - the main time for this withdrawal tends to occur within the first 30 days. It can be concluded that the individuals who make up this body of people who leave early were either accepted without adequate screening or that they misunderstood what the degree programme had to offer and what it expected in return. This finding brings the issue of 'selection' and recruitment into question.

9.2.5 Academic progression and performance

The theoretical framework is a longitudinal developmental model which seeks to illustrate and explain the main routes or 'pathways' of progression through a degree programme and thereby indicates the main points of deflection or where students are likely to be more academically 'at risk', or where they are more vulnerable to the forces which determine underachievement, referral or non-completion. The theoretical framework incorporates a second model which identifies the type of individual or student which may be 'at risk' and the reasons underlying that risk.

9.3 Contribution to knowledge

In terms of its contribution to the general philosophy relating to the study of Higher Education, this research offers a new dimension as a theoretical and conceptual framework which describes and explains the factors, reasons and processes which result in the individual decision to leave the degree programme. The research offers a new perspective with regard to the nature of student progression, the determinants which promote a successful academic performance and the problem of underachievement and non-completion in Higher Education. The results obtained through the process of this work offer a valid conceptual framework which can be called upon when planning to introduce and implement changes which will assist students who would otherwise be academically 'at risk'.

9.4 The theoretical framework as a universal model?

The research has addressed a particular complex problem - one of student academic performance, longitudinal progression, retention and non-completion. At the departmental level, this research has focused on a single degree - the B.Sc. (Hons.) programme in Building Technology and Management. This degree programme is typical of the type of vocational degrees offered by the 'new' universities. By its very nature, the course attracts students who already have some personal direction of their future career. In this case, the factors which determine academic performance and completion of the degree programme will differ from those students enrolled on more traditional 'academic' degree programmes. At the institutional level, the University of

Glamorgan is located within an economically depressed area of South Wales and as a consequence it strives to attract non-traditional entrants who otherwise would not be in Higher Education. The University, has traditionally attracted many entrants who come from the local area and this is a trend which is likely to increase as Government policy shifts the responsibility for the funding of Higher Education onto the individual participants and people seek opportunities to live at home while studying at university. As a consequence of this tendency to live at home while studying, the more personal factors which indirectly influence academic performance may diminish in their importance. In terms of generalisability, the theoretical framework presented provides an alternative perspective to the student experience of Higher Education and in particular an improved awareness of what the key factors are which determine success or failure in Higher Education. Although the framework is based upon a single degree programme it could be further developed and made applicable to all academic disciplines taught within the university sector.

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Improving Student Learning through Course Design
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The use of research to identify students 'at risk' of experiencing learning difficulties with mathematics

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Abstract

Current research is investigating factors which contribute to learning difficulties at undergraduate level. The BSc (Hons) Degree in Building Technology and Management has been identified as a vehicle for this study. A basic mathematical competence underpins the technological subjects and, to a lesser extent, the management subjects of this Course.

It has become evident over recent years that there has been a steady decline in the numerical ability of the students. As yet, there is no direct evidence that students enrolled on the Building Degree programme actually withdraw or fail through a lack of ability in pre-entry mathematics, but it is feared that many students, although ultimately successful, are experiencing fundamental learning difficulties with those subjects where the application of basic mathematics is an essential part.

The specific aims of this aspect of the research are to administer a mathematics diagnostic test on entry, compare the results from this test against the first semester examinations and thereby identify the main problem areas. In addition, interview transcripts will be analysed to further identify contributory factors relating to problems in the use of mathematics on the Course. The results from this work will contribute to a refined method of diagnostic testing and tuition in Building mathematics.

The paper will address issues relating to the teaching of mathematics on vocational Degree Courses, including diagnostic and remedial support; the redesign of modules where appropriate and holistic planning in Course design.

Introduction

Over the last ten years or so there have been substantial changes in the content and context of pre-university level mathematics courses. Moreover, the increase in student numbers and the widening of access to Higher Education means that students are now being accepted onto degree courses in Engineering and Built Environment Courses with relatively low mathematical qualifications. In some cases, the mathematical background is negligible. As a result, many lecturers in Higher Education have become concerned at the variability of mathematical knowledge between their students and in particular the notable absence of a competence in algebra and trigonometry. The problem being exacerbated for those universities which take student with relatively low Advanced Level GCE grades and a

higher proportion of BTEC entrants.

The reasons for this decline in mathematical ability may be attributed to two main reasons: (a) an increase in the number of non-traditional students entering Higher Education without the standard entry requirements and (b) the content of pre-university courses in mathematics. The national curriculum emerged as a response to employers' needs throughout the 1970's and 80's - largely in relation to developing applied mathematical skills rather than equipping students with a fundamental grounding in mathematics.

An analysis of pre-university mathematics courses reveals a decreasing emphasis on a number of traditional topics studied at that level. School mathematics, since the introduction of the General Certificate in Secondary Education, has shifted from the more analytical and abstract concepts of mathematics towards a more practical approach which can be related to everyday life. Approximately one fifth of the old O' Level GCE curriculum has been replaced by shape, geometry and statistical probability - the area of algebra being reduced to accommodate this change.

This problem may be more acute for vocational and professional degree courses, such as the Building Degree course at the University of Glamorgan, where the risk is that most students will proceed through the first and second years of study and to finally graduate, without being properly schooled in a level of mathematics essential for a career within the construction industry at management level.

Assessing student capability

At present, the only indicator used to judge student mathematical capability at entry is their GCSE grades. The minimum entry requirement for the Building Technology and Management degree is a grade C or above at GCSE. The obvious solution would be to only admit students with this level of qualification. However, three problems arise: (a) this would drastically reduce recruitment numbers (which are already falling) as many students currently enrol on the course without a GCSE in mathematics, (b) there is no evidence to support an argument which states that a student with a grade C at GCSE will not experience difficulty with building mathematics at degree level and (c) there are two levels at GCSE - the Higher and the Intermediate level, and there is rarely information as to whether the student has studied for the Higher or the Intermediate level paper at entry.

In addition to GCSE grades, students are enrolled on the Building Degree Course from the BTEC Construction and Building Studies route. As a part of this route, many students study building mathematics and surveying techniques, but the actual quantity and depth of tuition cannot be guaranteed. However, students who entry via the traditional Advanced Level or non-traditional route are more likely to be the students who do not possess adequate mathematical training or knowledge for a degree in building.

Methodology

The study is directed around a single course: the Honours Degree programme in Building Technology and Management which is offered at the University of Glamorgan by the School of the Built Environment. As a vocationally orientated degree course it attracts students from a variety of educational backgrounds. Consequently, they arrive at the

University of Glamorgan with a wide range of knowledge and skills which may or may not be related to building. The type and standard of the pre-Higher Education qualifications held by entrants are therefore quite variable. A majority of the students coming onto the course do so via the Business and Technological Education Council with a Higher National Certificate or Ordinary National Certificate in either Building Studies, Construction or other related disciplines. In addition, students may also enter the course with an Advanced General Certificate in Education, City and Guilds qualification, a BTEC Higher National Diploma or overseas qualifications. The minimum entry requirement for mathematics, normally, is at least a grade 'C' at GCSE in mathematics. However, of the 28 entrants, only 83.3% actually possess a grade 'C' at GCSE or above.

Aims and objectives

A basic level of numeracy is essential for success in both the study and practice of Building. From experience, academic staff have found that many students have struggled with subjects such as structures, environmental science, surveying, building services and materials because they possibly lack sufficient knowledge and competence in the use of mathematical equations which are essential in many applications of these subjects. Therefore difficulties are experienced not because the concepts are necessarily difficult, but because the students have trouble in using basic mathematical techniques to solve the problems set. In most cases, the problem can be solved with simple algebra.

A mathematical test was given to all Level One students to diagnose individual strengths and weaknesses of each student before they embark upon their Level One programme. The test was designed with the aim of identifying specific weaknesses in areas of experience and knowledge of essential mathematical concepts, required for the study of Building. During induction week at the start of the academic year 1995-96, all Level One undergraduate students who enrolled on the BSc Honours degree programme in Building Technology and Management at the University of Glamorgan were asked to take a diagnostic test in building mathematics. The test given, was specifically made up of basic mathematical questions relevant to the building degree programme. The paper was divided into eight main areas designed to test the students' knowledge and competence in: arithmetic, algebra, equations, scientific notation, indices, logarithms, graphs and trigonometry - covering core material regarded as important elements of building mathematics. A total of 28 students participated in the test which took 45 minutes to complete. The use of calculators was not permitted at any point in the test. A copy of the test appears in Appendix A.

The main objective was to identify fundamental and often common weaknesses in mathematical ability with the aim of addressing the problems encountered and to provide specific information which may assist lecturing staff in the preparation of additional study material and possible changes in course delivery. It is recognised that the time available in the first year of a degree programme may not allow for extensive coverage of all the basis principles of mathematics required for studying a degree in building and it is therefore important for the academic staff involved with the teaching of building mathematics to effectively direct their efforts in covering essential elements of mathematics required by a majority of the students on the course. The final aim of the test was to collect further information which could be analysed and used in the preparation of additional study material and possible changes in module/course delivery. In addition, interview transcripts will be analysed to further identify contributory factors relating to problems in the use of

mathematics on the Course.

Results

The test was marked by giving an overall percentage mark for each student. The average mark was a disappointing 33.5%. However, interesting observations were noted when marking the scripts. It was evident that many students had particular difficulty with questions on: algebra, trigonometry, logarithms and in the use of equations and indices. More specifically in the areas of: changing the subject in equations (Q.5 see Appendix A), the use of indices (Q.7), logarithms (Q. 8 & 9) and the equation of a straight line (Q.10).

Interview Transcripts

Interview transcripts were also analysed to further identify contributory factors relating to problems in the use of mathematics on the Course. Mature students identified specific problems with algebra and put this down to a lack of faith in their own ability to cope with the problem, rather than a lack of ability to cope. One traditional entrant (18 year old) noted that mature students tended to struggle more with the mathematics component of the course....

"People with work experience (those from industry) struggle more with maths" Another said there was .."too much maths in the course".

Students from the BTEC OND/HNC in Construction or Building Studies routes tended to feel more confident about their ability to cope with the mathematical elements of the Course because these vocational pre-entry courses had already covered the basics in building mathematics, but one of these students still felt that the Level One Module in "Building Mathematics & Computing" "...maybe taught a bit too fast..."

One traditional entrant remembered a dislike for mathematics at school ...I didn't like maths at school... I think you either have the ability or your don't...

Implications

Unlike a mathematics or engineering degree programme, which depend upon a reasonably extensive grounding in mathematics, degrees in building require a different and less rigorous knowledge base, which includes a good grounding in: algebra, trigonometry, logarithms and the use of equations and indices.

At the *Higher Education* level it is therefore necessary to address the problem of an increasing number of students entering university poorly prepared for studying certain areas of the Building Degree Course. In order to correct these deficiencies, four areas need to be addressed in the teaching of Level One undergraduate students: (a) encouragement of a greater understanding of the basic concepts required within the construction industry (b) to address the inappropriate learning strategies adopted by some students before they arrive at university (c) to focus upon specific areas within mathematics which are crucial elements of the course (d) to be prepared to reteach basic concepts within the degree programme and not to rely upon a preconceived idea that all Level One students

come to university properly equipped with adequate knowledge and skills in mathematics as required for immediate progression onto a degree programme in building.

It is believed that some students may suffer, in terms of lost confidence, due to their inability to tackle the mathematical components of the degree programme as well as they might have hoped. It is not suggested that a student who experiences difficulty with the mathematics component of the course will do so in such a way to be detrimental to his or her overall success on the course. In fact, it may be a small problem, such as a difficulty in coping with mathematics and the mathematically related subjects in the early stages of Level One may be *frightening* students off the degree programme unnecessarily.

The implications of this work to date raise important questions in relation to addressing learning difficulties experienced by students. In particular:

(a) in the teaching of mathematics at first year undergraduate level on vocational courses such as Building;

(b) in the redesign of a level one module which may be a crucial element in the understanding and application of mathematical concepts throughout the degree programme;

(c) and in holistic planning in course design.

How to redesign a module through improved teaching and learning

It must be recognised that if students have never studied a particular topic in mathematics or if they have only spent a small amount of time on it in the past, they are likely to find it very difficult to learn a new mathematically based topic if university lecturers assume the students have this prerequisite. This has nothing to do with the student's intellectual ability, but it does have a lot to do with their education - past and present. It is therefore evident that there is a need for some sort of readjustment in the teaching of mathematics and numerically based subjects in Higher Education courses. However, as with any changes, care needs to be taken when redesigning new teaching and learning objectives.

Possible Solutions and Recommendations for improved learning

As with all educational objectives, the teaching strategy adopted must be carefully considered if any real improvement is to take place. In such cases, the immediate temptation is to employ student centred learning techniques (open and flexible learning packages) and educational technology (computer packages and computer aided learning). All have their virtues, but they must be used in moderation. Open and flexible learning packages need to be carefully devised and utilised with every care being made to give the student an opportunity to identify, address and solve their individual understanding and learning problems. It is essential that individual needs are identified and in the majority of cases, students will need one-to-one tuition. The rise of open and flexible learning packages and computer assisted learning may not be the sole answer to the problem.

Recommendations

It is evident from the foregoing that a carefully considered balance must be struck between traditional lectures and tutorial support and that which is available from open and flexible learning and computer assisted learning packages.
For the BSc (Hons) Degree in Building Technology and Management, the following compromise has been developed:

(1) Open and Flexible Learning Packages

- self-explanatory booklets with step-by-step methods
- coverage of the most important topics in building mathematics in depth (eg. algebra and trigonometry)
- good practical examples - using the building industry as a vehicle to promote relevance to the outside world and therefore greater understanding

(2) Lectures/workshops, small group tutorials and 'surgeries'

- slow down the overall tuition in Level One "Building Mathematics and Computing"
- to provide weekly 'surgeries' and encourage students to come forward with their
  understanding and learning problems

This in turn will be subject to further review and refinement. In this way, the educational support is evolving, adapting to both the challenging background of student ability at intake and also takes into account individual needs.

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A Summary of Topic Areas Studied in Semester A - Level One on the Building Mathematics & Computing Module

Module Contents

Calculators and calculations: estimation; checking calculations; mensuration of common areas and volumes.

Basic Algebra: indices and logarithms; algebraic manipulation; evaluation of formulae and dimensional analysis.

Basic Trigonometry: trigonometric ratios for any angle; simple identities; sine and cosine; two and three dimensional problems.

Functions & their graphs: polynomials; trigonometric; inverse trigonometric; exponential and logarithmic.

Geometry in Building: classical proportion; golden ratio; space filling into two and three dimensions; tessellations; polyhedra and quadric surfaces used in buildings.

Statistics: frequencies (mode, median and mean); measures of dispersion; uses of the normal distribution; sampling; estimating and hypothesis testing.

Solution of equations: graphical methods; simple trigonometric equations; bisection and iteration (Newton-Raphson method); linear simultaneous equations by elimination; simple linear inequalities and their graphs.

Computer usage: introduction to microcomputers; operating systems; wordprocessing; spreadsheets and databases; introduction to computer programming in BASICS and flowcharts (applicable to building problems).

Appendix A

MATHEMATICAL DIAGNOSTIC TEST

Maximum time allowed 45 minutes.
The use of calculators is not permitted.

A basic level of numeracy is essential for success in both the study and practice of building. From experience, academic staff have found that many students have struggled with subjects such as structures, environmental science, building services and materials, because equations are needed in many applications of these subjects. In many cases, difficulties are experienced not because the concepts are especially tricky, but because students have trouble in using basic mathematical techniques to solve the problems set. In most cases, the problem can be solved with simple algebra.

The purpose of this is to establish the overall ability of first year students in dealing with basic mathematical operations. Information gained from this exercise will help with the preparation of additional study material and possible changes in course delivery.

Marks awarded in this test will not in any way contribute to your formal assessment on the course.

Please complete the details below and write your answers on the question paper itself.

Name .....

Course .....

ARITHMETIC

Q.1 What are the values of the following quantities:

(a) 2 x (-3) =
(b) (-4) x (-2) =
(c) 2 / (-4) =
(d) (6 - 2) / (-4) =
(e) 2 x (6 / 3) - 1 =

Q. 2 Simplify the following:

(a) (3 / 4) x (12 / 9) =

(b) $(8 / 9) \times (27 / 16) \times (-2 / 3)$ =
(c) $(3 / 4) \times (3 / 2) \times (7 / 2)$ =

ALGEBRA

Q.3 Solve the following equations:

(a) $x + 3 = 7$

(b) $3y - 4 = -13$

(c) $a^2 - 12 = 52$

(d) $(2 \times 10^2) / (z + 1000) = 4 \times 10^{-2}$

(e) $\log x = 2$

Q.4 Which values of x and y satisfy both of the following equations:

$2x + 3y = 0$
$x - y = 5$

Q. 5 Changing the subject of equations:

(a) Rewrite $V = IR$ so that I is the subject not V
(b) Rewrite $q = kAT/x$ so that k is the subject not q
(c) Rewrite $E = mc^2$ so that m is the subject not E
(d) Rewrite $E = 0.5mv^2$ so that v is the subject not E
(e) Rewrite $L = 10 \log (I/Io)$ so that I is the subject not L
(f) Make C the subject of the equation $F = (9 / 5) C + 32$ and find the value of C when F = 212

Q.6 Scientific notation:

Rewrite the following numbers in "scientific notation" ie., as a power of ten multiplied by a number with only one (non-zero) figure before the decimal point.

Example: $115 = 1.15 \times 10^2$

(a) 12345 =

(b) 724 =

(c) 0.014 =

(d) 346×10^4 =

(e) 242.3×10^{-3} =

Q.7 Indices:

Indices are a concise way of writing down repeated multiplication and they can be manipulated by using a smaller number of established rules of indices.

Simplify the following expressions:

(a) $a^4 \times a^6 / a$

(b) $(a^3)^2$

(c) $a^{-2} \times a^{7/2}$

(d) $a^3 \times a^{-3}$

Q.8 Logarithms:

Evaluate the following logarithms (all to the base 10):

(Note that if $10^x = y$, then log $y = x$. Example: since $10^2 = 100$, then log $100 = 2$)

(a) log 1000 =
(b) log 10 =
(c) log 0.001 =
(d) log 1 =

Q.9 All of the following logarithms (to the base 10) can be evaluated given that log 2 = 0.301

Express the number (whose logarithms is required) as 2 multiplied by a power of 10, or 2 raised to a power or both:

Example: log 20 = log raised (2 x 10) = log 2 + log 10 = 0.301 + 1 = 1.301.

(a) log 200 =

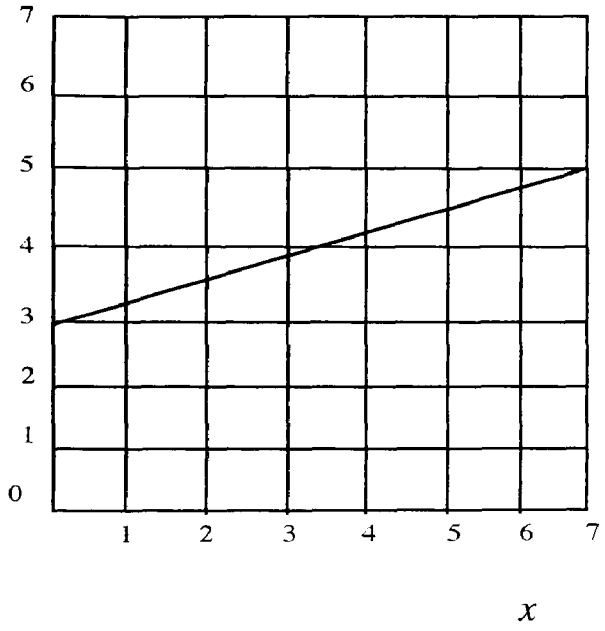
(b) log 0.2 =

(c) log 0.4 =

(d) log 32 =

GRAPHS

Q. 10 Consider the graph shown below:



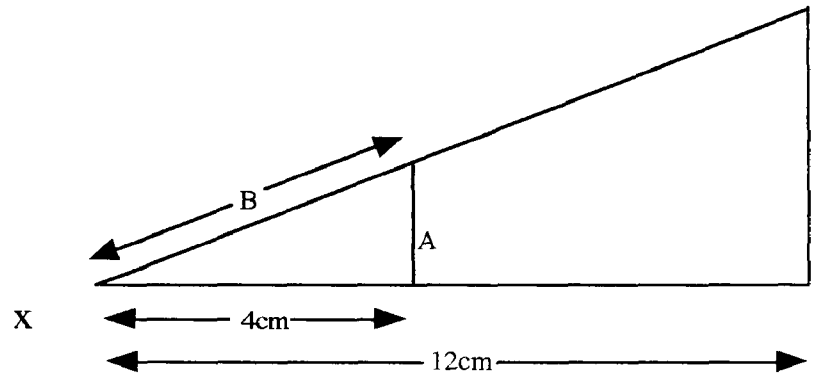
(a) What is the gradient?
(b) What is the intercept (on the y axis)?

Q. 11 For the graph $y = 6x + 5$

(a) What is the gradient?
(b) What is the intercept?

TRIGONOMETRY

Q.12 Refer to the figure shown below and determine the values of the following quantities:



(a) A
(b) B
(c) sin x
(d) cos x
(e) tan x

Appendix B

Intellectual Development Questionnaire

Instructions

This questionnaire lists a series of statements about various topics. Read each statement and decide whether you agree or disagree with each statement as follows:

A	strongly agree
B	slightly agree
C	slightly disagree
D	strongly disagree

Mark down your choice A, B, C or D by circling the appropriate letter. There are no time limits, but work as quickly as possible - do not think too hard about each statement.

1.	There are some areas of my life where nothing is either right or wrong, but rather a matter of personal preference.	A B C D
2.	What happens in my life is usually up to me - I do what I think is right for me.	A B C D
3.	The safest decision is no decision at all.	A B C D
4.	I never disagree with other people - especially my lecturers.	A B C D
5.	I always think through problems thoroughly before taking action.	A B C D
6.	I prefer lecturers to simply tell me what to study and learn.	A B C D
7.	A lecturer's job is to communicate <u>all</u> of the facts to his or her students.	A B C D
8.	I have sorted through my beliefs and I have decided which ones to keep and which ones to leave out.	A B C D
9.	Almost anything can be viewed from any perspective.	A B C D
10.	If I had a personal problem, I would want a parent, counsellor or tutor to tell me what to do.	A B C D
11.	Everyone has a right to their own opinion - all opinions are equal.	A B C D
12.	I frequently have difficulty in accepting the consequences of my own decisions.	A B C D

13.	I base many of my major decisions in life on the advice given by other people or on what I see other people do.	A B C D
14.	Every person's opinion should be weighed with equal consideration.	A B C D
15.	My interpretation of a passage in a text book sometimes differs from that of my tutor or friends.	A B C D
16.	I am committed to this course. I would not consider doing anything else.	A B C D
17.	I often consider the potential effects of my behaviour on the good of society and I am aware that I have to accept full responsibility for my own actions.	A B C D
18.	My beliefs about current issues are often influenced by the opinions of other people.	A B C D
19.	Issues are so complex today, a person should adopt a single stance only on rare occasions.	A B C D
20.	In today's world, a person cannot be certain about choosing the right options.	A B C D
21.	I have decided what I would like to do after university.	A B C D
22.	Circumstances and luck usually determine a person's future.	A B C D
23.	I am responsible for all of my choices in life.	A B C D
24.	I am beginning to plan how I can balance other aspects of my life with my studies at university.	A B C D
25.	It is the job of the university to guide students into the right occupations.	A B C D
26.	Sometimes there can be only a right or wrong answer to a question, but in other situations there are no right answers.	A B C D
27.	Every student has a right to their own opinion - the lecturer is not always right.	A B C D
28.	One thing is certain: Even if there is an absolute truth, the human race will never know it and therefore we must learn to live in an uncertain world.	A B C D
29.	I prefer lecturers/teachers who present the 'right' answers to a question and who explain why the 'wrong' answer is so.	A B C D
30.	I prefer lecturers/teachers who acknowledge the existence of several theories, but state which one is 'right'.	A B C D

31.	I used to think that scientists had an answer for everything, instead no theory is absolutely 'right'.	A B C D
32.	I have yet to decide what I will do after university.	A B C D
33.	My success on this course lies with the lecturing staff and their ability to teach their subject.	A B C D
34.	I often wonder if I am doing the right thing by doing this degree.	A B C D
35.	I only make my own opinion on something when the experts do not agree.	A B C D
36.	Disagreements regarding important issues are best left to the experts.	A B C D
37.	I have made a major commitment in at least one main area of my life	A B C D
38.	I continually question what I am doing with my life.	A B C D
39.	I have difficulty in focusing on a single vocational choice. That is why I am doing a degree to give me time to decide on what I would like to do with my life.	A B C D
40.	When I hear an opinion different from my own. I often question why they think that way.	A B C D

Many thanks for completing this questionnaire.
I assure you that the questionnaire will be completely confidential.

I wish you good luck with your studies.

For Office Use:

D .....
M .....
R .....
C .....

Intellectual Development
Score Sheet

Instructions

This questionnaire lists a series of statements about various topics. Read each statement and decide whether you agree or disagree with each statement as follows:

A	strongly agree
B	slightly agree
C	slightly disagree
D	strongly disagree

Mark down your choice A, B, C or D by circling the appropriate letter. There are no time limits, but work as quickly as possible - do not think too hard about each statement.

1.	There are some areas of my life where nothing is either right or wrong, but rather a matter of personal preference.	A B C D R
2.	What happens in my life is usually up to me - I do what I think is right for me.	A B C D C
3.	The safest decision is no decision at all.	A B C D R
4.	I never disagree with other people - especially my lecturers.	A B C D D
5.	I always think through problems thoroughly before taking action.	A B C D C
6.	I prefer lecturers to simply tell me what to study and learn.	A B C D D
7.	A lecturer's job is to communicate <u>all</u> of the facts to his or her students.	A B C D D
8.	I have sorted through my beliefs and I have decided which ones to keep and which ones to leave out.	A B C D C
9.	Almost anything can be viewed from any perspective.	A B C D R
10.	If I had a personal problem, I would want a parent, counsellor or tutor to tell me what to do.	A B C D D
11.	Everyone has a right to their own opinion - all opinions are equal.	A B C D M
12.	I frequently have difficulty in accepting the consequences of my own decisions.	A B C D C-ve
13.	I base many of my major decisions in life on the advice given by other people or on what I see other people do.	A B C D R

14.	Every person's opinion should be weighed with equal consideration.	A B C D M
15.	My interpretation of a passage in a text book sometimes differs from that of my tutor or friends.	A B C D R
16.	I am committed to this course. I would not consider doing anything else.	A B C D C
17.	I often consider the potential effects of my behaviour on the good of society and I am aware that I have to accept full responsibility for my own actions.	A B C D C
18.	My beliefs about current issues are often influenced by the opinions of other people.	A B C D D
19.	Issues are so complex today, a person should adopt a single stance only on rare occasions.	A B C D M
20.	In today's world, a person cannot be certain about choosing the right options.	A B C D M
21.	I have decided what I would like to do after university.	A B C D C
22.	Circumstances and luck usually determine a person's future.	A B C D R
23.	I am responsible for all of my choices in life.	A B C D C
24.	I am beginning to plan how I can balance other aspects of my life with my studies at university.	A B C D M
25.	It is the job of the university to guide students into the right occupations.	A B C D D
26.	Sometimes there can be only a right or wrong answer to a question, but in other situations there are no right answers.	A B C D R
27.	Every student has a right to their own opinion - the lecturer is not always right.	A B C D M
28.	One thing is certain: Even if there is an absolute truth, the human race will never know it and therefore we must learn to live in an uncertain world.	A B C D M
29.	I prefer lecturers/teachers who present the 'right' answers to a question and who explain why the 'wrong' answer is so.	A B C D D
30.	I prefer lecturers/teachers who acknowledge the existence of several theories, but state which one is 'right'.	A B C D M
31.	I used to think that scientists had an answer for everything, instead no theory is absolutely 'right'.	A B C D R

32.	I have yet to decide what I will do after university.	A B C D C-ve
33.	My success on this course lies with the lecturing staff and their ability to teach their subject.	A B C D D
34.	I often wonder if I am doing the right thing by doing this degree.	A B C D R
35.	I only make my own opinion on something when the experts do not agree.	A B C D D
36.	Disagreements regarding important issues are best left to the experts.	A B C D D
37.	I have made a major commitment in at least one main area of my life.	A B C D C
38.	I continually question what I am doing with my life.	A B C D R
39.	I have difficulty in focusing on a single vocational choice. That is why I am doing a degree to give me time to decide on what I would like to do with my life.	A B C D M
40.	When I hear an opinion different from my own. I often question why they think that way.	A B C D M

Appendix C

Approaches to Studying Inventory

For the following questions please indicate whether you agree or disagree with the statement by ticking the appropriate box

Strongly agree	4
Agree	3
Dont Know	2
Disagree	1
Strongly disagree	0

	4	3	2	1	0
Meaning Orientation					
Deep Approach					
I usually set out to understand thoroughly the meaning of what I am asked to read	4	3	2	1	0
I often question what I hear or read	4	3	2	1	0
I put a lot of effort into trying to understand the things I first find difficult to understand	4	3	2	1	0
When I am tackling a new topic, I often ask myself questions about it and how I should answer them	4	3	2	1	0
Comprehension Learning					
Ideas in books often set me off on long chains of thought of my own	4	3	2	1	0
In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer to the solution	4	3	2	1	0
I like to play around with ideas of my own even if they don't get me very far	4	3	2	1	0
Often when I am reading books, the ideas produce vivid images which sometimes taken on a life of their own	4	3	2	1	0
Relating Ideas					
I try to relate ideas in one subject to those in others	4	3	2	1	0

I often try to relate new ideas to real life	4	3	2	1	0
I need to read around the subject pretty widely before I am ready to put my ideas down on paper	4	3	2	1	0
I find it really useful to 'map out' a new topic to see how it fits into the whole course	4	3	2	1	0
Use of Evidence					
When reporting on practical work, I like to vary the ways in which I interpret and present the findings	4	3	2	1	0
I am very cautious about drawing conclusions unless they are well supported by evidence	4	3	2	1	0
Puzzles or problems fascinate me, I like working through material in order to reach a logical conclusion	4	3	2	1	0
When I read articles or reports, I always examine the evidence presented to see if the conclusion is justified	4	3	2	1	0

Reproducing Orientation

Surface Approach					
Lecturers always seem to make things complicated	4	3	2	1	0
I memorise a good deal of what we have to learn	4	3	2	1	0
I usually do not have time to think about the implications of what I have just read - I just learn it	4	3	2	1	0
I often read and learn things without really understanding them	4	3	2	1	0
I only learn what I need to know to pass my exams	4	3	2	1	0
When I am reading I try to memorise important facts which may come in use later on in my course	4	3	2	1	0
Improvidence					
Although I generally remember facts and details, I find it difficult to fit them together into an overall picture	4	3	2	1	0
I find it difficult to "switch tracks" when working on a problem: I prefer to follow each line of thought as far as it will go	4	3	2	1	0
Tutors seem to want me to be more adventurous in making use of my own ideas	4	3	2	1	0

I find I tend to remember things best if I concentrate on the order in which the lecturer presented them	4	3	2	1	0
Fear of Failure					
I find the continual pressure of work often worries me	4	3	2	1	0
I sometimes wonder if I will fail or never complete the course	4	3	2	1	0
Having to speak in tutorials and for presentations worries me a lot	4	3	2	1	0
Syllabus-Boundness					
I prefer courses to be clearly structured and well organised	4	3	2	1	0
I tend to read very little around the subject	4	3	2	1	0
I like to be told what to study and what to put into my assignments	4	3	2	1	0

Motivation

Intrinsic Motivation					
My main reasons for being here is to learn about the things that really interest me	4	3	2	1	0
I find that studying academic topics can often be really exciting	4	3	2	1	0
I spend a good deal of my spare time finding out about the topics discussed in lectures and tutorials	4	3	2	1	0
I find the course really interesting and would like to continue studying after I finish the course on maybe a Masters or Doctorate programme	4	3	2	1	0
Extrinsic Motivation					
I chose this course because I thought it would increase my chances of getting a better job afterwards	4	3	2	1	0
I chose this course because I want to work in the building field	4	3	2	1	0
I am doing this course more for 'career' reasons than through personal interest in the subject	4	3	2	1	0
I suppose I am more interested in the qualification than in the course itself	4	3	2	1	0

Achievement Motivation					
It is important for me to do better than my friends on the course	**4**	**3**	**2**	**1**	**0**
I find it helpful to 'map out' a new topic for myself by seeing how ideas fit together	**4**	**3**	**2**	**1**	**0**
It's important for me to do really well in the course here	**4**	**3**	**2**	**1**	**0**
I hate admitting defeat, even in trivial matters	**4**	**3**	**2**	**1**	**0**
Strategic Approach					
Lecturers sometimes give indications of what might be required in an assignment or exam, so I look for hints	**4**	**3**	**2**	**1**	**0**
When doing a piece of work, I try to bear in mind what the lecturer really wants from me	**4**	**3**	**2**	**1**	**0**
If conditions are not right for me to study, I change them	**4**	**3**	**2**	**1**	**0**
One way or another I manage to get hold of the books I need for studying	**4**	**3**	**2**	**1**	**0**
I certainly want to pass my course, but it doesn't really matter if I just scrape through	**4**	**3**	**2**	**1**	**0**